# ELECTRICAL WEST

A McGRAW-HILL PUBLICATION

May 1959
50 Cents

West's First Once-Through Boiler

# Another Order on the Way!

RT&E's Portland plant employees watch with pride as a shipment of distribution transformers is delivered to an important west coast customer.

This is typical of the fast service that is now available to all west coast transformer users from this new manufacturing plant.

Your representatives are cordially invited to visit us here in Portland and inspect the facilities that are at your service.

RT&E

ENGINEERING TALENT CONCENTRATED ON ONE IDEA — A BETTER TRANSFORMER

CORPORATION

WAUKESHA, WISCONSIN • PORTLAND, OREGON

* RT&E GROWS TO BETTER SERVE THE GROWING WEST

First Once-Through Boiler

# editorial views EW


## Advisory Board

**Pacific Southwest Region**

J. F. Davenport, executive Vice-President
Southern California Edison Co., Los Angeles
R. H. Cockfield, Business Agent
Department of Water & Power, Los Angeles
Joseph Pengilly, Vice-President
Square D Co., Los Angeles
Leonard Hobbs, Vice-President
Smoot-Holman Co., Inglewood
H. C. Gerster, Manager, Western Zone
General Electric Supply Co., Los Angeles
Sidney Hill
Hill Electric Co., Los Angeles
C. M. Smith, Sales Manager
Fluor Corp., Los Angeles
Victor Hartley, Managing Director
PCEA, Los Angeles

**Northern California Region**

Walter Maytham, Vice-President
Westinghouse Electric Corp., San Francisco
Norman R. Sutherland, President
Pacific Gas & Electric Co., San Francisco
Fred Nicholas
F. M. Nicholas Co., San Francisco
Alfred H. Meyer, President
Leo J. Meyberg Co., San Francisco
Arthur Dahl, Sales Manager
General Electric Supply Co., San Francisco
Paul Churchill, Regional Manager
Line Material Industries, South San Francisco
George Abbett, President
Abbett Electric Co., San Francisco
Karl Bausch, Chief Electrical Engineer
Bechtel Corp., San Francisco
Walter Bayha
Bayha, Weir & Finato, San Francisco

**Intermountain Region**

R. D. Moody, Manager
Allis-Chalmers Mfg. Co., Denver
David B. Hyer Jr., President
Southern Colorado Power Co., Pueblo
D. E. Provost
Stearns-Roger Mfg. Co., Denver
Ralph Johnson, Vice-President & General
Manager, Sturgeon Electric Co., Denver
Ken G. Eaton, District Manager
Anaconda Wire & Cable Co., Denver
Howard Peterson
Peterson Co., Denver
Ralph Hubbard, Managing Director
RMEL, Denver
W. W. Bowman, Director of Publicity
Utah Power & Light Co., Salt Lake City
A. E. Fleming, District Manager
General Electric Supply Co., Denver
John Kimball, Vice-President & General
Manager, Idaho Power Co., Boise

**Pacific Northwest Region**

Eric Nelson
Shafer & Nelson, Seattle
Charles H. Cutter, Northwest Representative
Federal Pacific Electric Co., Seattle
Ralph James
Northwestern Agencies, Seattle
R. B. Lane, President
Industrial Electric Co., Seattle
Beverly Travis, Consulting Engineer
Seattle
Eugene Starr, Chief Engineer
Bonneville Power Administration, Portland
Thomas W. Delzell, Chairman of Board
Portland General Electric Co., Portland
D. R. McClung, President
Pacific Power & Light Co., Portland
James F. Grieve, Vice-President
C. C. Moore, Engineers, Portland
Max Wood
Schwager-Wood Co., Portland
R. H. Sroufe, Executive Vice-President
Stubbs Electric Co., Portland
Alden F. Krieg, Managing Director
NELPA, Portland
Jack D. Stevens
Puget Sound Utilities Council, Seattle


**Penny Foolish** — The outbreak of a serious epidemic of dysentery in a San Francisco institution points up the fact that people outside our industry just don't know the facts of living electrically and the need for persistent selling on the part of the industry itself. In the case in question, 35 young children and infants were stricken with this dangerous malady that thrives in unhygienic conditions.

The staff of the institution had repeatedly requested funds to buy nine electric dishwashers, not only because they save time and labor, but also because electric dishwashing temperatures and water cycles insure clean, sterile dishes. Each time the funds were refused. This is not to say that dirty dishes either caused or aggravated the epidemic in this case. It does, however, emphasize that, **in public eating places, dishes and utensils are the easiest way of all of spreading germs and bacteria if all sanitary precautions are not utilized. The electric dishwasher thus becomes an indispensable item in the kitchens of every organization that feeds people en masse. Sometimes it takes calamity to drive an idea home.**

—EW—

**Financing Tip** — An executive of one of the large diversified closed-end funds suggests that the use of serial convertible debentures to finance the growth of the nation's public utilities would be mutually beneficial to investors and utilities. In stating his case he cited five specific advantages of this type of security over either common stocks or unsecured bond issues.

From the utility standpoint, the interest charges can be deducted from earnings before taxes; the common stock into which the debentures can be converted can be sold for a price substantially above book value and generally at a premium over a straight stock offering; and the initial dilution of stockholders' equity is delayed because the proceeds from a serial convertible issue may be included in the utility's rate base, resulting in higher earnings for a few years. Coupon interest rates for convertible debentures are lower than on other nonsecured debentures.

From the investor standpoint, certain financial institutions are not permitted to own common stocks but may purchase convertible debentures, thereby broadening the market and enabling utilities to tap another reserve of investor funds.

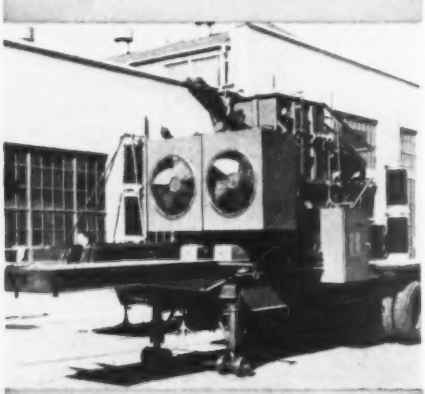
**In this day and age, when institutional funds are becoming more and more important as sources of money for new construction, perhaps consideration of the use of some of the less popular types of obligations may merit investigation.**

—EW—

**What's Cheapest?** — Okanogan County PUD commissioners have announced the retirement of their Similkameen hydroelectric plant as of July 20. The construction of a Bonneville substation and a connecting line to Tonasket make it possible to buy power cheaper than to generate it even from falling water in an existing older plant. **This anomaly points up two things. First, Bonneville power is not as cheap as it might appear. Part of the price comes due every April 15 as all are aware of right now. Second, it is sound long-range thinking to allow any hydro potential to lie fallow for the sake of a temporary economic gain?**

Conservationists, arise. Surely there is some bureau, department or agency that can be marshaled to use the rejected falling waters of the Similkameen.

Watch Rocket Tests With TV ... 78



Mobile Power Transformers ... 70

Water Outlook for the West ... 67

Put Your Brand on

**$500 of Stock**

Use Card on p 115 to enter

Electrical West's KWH Rodeo

# ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U.S. Established 1887

C. W. Leihy, Publisher and Editor
W. A. Cyr, Consulting Editor
Peggy Boyer, Associate Editor
Jack Robinson, Engineering Editor
Miriam Stuart, Editorial Assistant

George C. Tenney, President
Dale VanHorn, News Editor
Marvin Petal, Pacific Southwest Region
Frank Pitman, Intermountain Region
Ray Bloomberg, Pacific Northwest Region

## CONTENTS

VOL. 122, NO. 5 MAY 1959

First Once-Through Boiler by J. B. Moore ... 65
Costs Favor Gas Turbines by W. D. Kirkland ... 72
Additions Require Teamwork by Charles Krieger ... 74
Production of Heat in a Motor by Tom Hughes ... 75
Sawtooth Luminous Ceiling Design ... 77
Aluminum Duct for Kaiser ... 80
Edison Heat Pump Fairs ... 83
PG&E Makes Air Conditioning Survey ... 84
PCEA Tackles Tomorrow's Problem Today ... 86
EMEA Learns New Methods ... 96

**The Cover—Southern California Edison Co.'s Huntington Beach steam station will have the West's first once-through boiler. See story on p 65.**

### DEPARTMENTS

Book Reviews ... 56
Bulletins ... 26
Construction News ... 81
Editorials ... 1
Electra's Husband ... 60
Kwh Rodeo ... 115
News ... 102
News Roundup ... 7
Product News ... 14
Advertising Index ... 123, 130

**ADVERTISING REPRESENTATIVES**

**ATLANTA 3: Robert Powell, Rhodes-Haverty Bldg.; CHICAGO 11: W. C. McMurray Jr., 520 N. Michigan Ave.; CLEVELAND 13: Francis X. Roberts, 1164 Illuminating Bldg., 55 Public Square; DENVER 2: John Patten, 1740 Broadway, AL 5-2981; LOS ANGELES 17: Russ Antles, 1125 W. Sixth St., HU 2-5450; NEW YORK 36: Dick Thompson, 500 Fifth Ave.; SAN FRANCISCO 4: T. H. Carmody, Advertising Sales Manager, Don Farris, Dick Alcorn, Bernice Johnston, Advertising Production Manager, 68 Post St., DO 2-4600.**

Offices: Boston, Dallas, Detroit, Philadelphia, Pittsburgh, St. Louis

**Electrical West** (with which is consolidated The Journal of Electricity), May 1959, Vol. 122, No. 5. Published semimonthly except November when published trimonthly by McGraw-Hill Company of California, James H. McGraw (1860-1948) Founder. Office of publication, 235 N.W. Park Ave., Portland 9, Ore. See panel below for directions regarding subscriptions or change of address.

**Executive, editorial, circulation and advertising offices:** 68 Post St., San Francisco 4, Calif. Donald C. McGraw, chairman of the board; George C. Tenney, president; John W. Otterson, vice-president; B. M. Boccoli, secretary and treasurer.

**Position and company connection must be indicated on subscription orders.** Send to address shown in panel below. Subscription price includes the regular monthly issue, the news letter issue and the November directory issue. United States subscription rate $3 a year, single copies 50c (November directory issue $1). Latin American Republics and Philippine Islands $4 a year; Canada $3.50 a year; all other countries $4 a year. Entered as second class matter, Dec. 17, 1956, at the post office at Portland, Ore., under the act of March 3, 1879. Printed in U. S. A. Title registered in U. S. Patent Office. © Copyright 1959, McGraw-Hill Company of California. All rights reserved.

SUBSCRIPTIONS: Send subscription correspondence and change of address to Subscription Manager, Electrical West, 68 Post St., San Francisco 4, Calif. Allow 30 days for change of address.

**Postmaster: please send notice 3579 to Electrical West, 68 Post St., San Francisco 4, Calif.**

# NEW SERIES DF-1

# "Earth-Master"

## PORTABLE HYDRAULIC HOLE DIGGER

**PRICED TO FIT THE MOST MODEST BUDGET**

This new Series DF-1 "Earth-Master" digs straight, clean holes—up to 20" in diameter and 10' in depth—in practically any type of soil. It digs close to poles, fences and buildings, reaches areas inaccessible to "fixed position" units, swings out of the way to permit unrestricted use of the derrick and can be easily transferred to another vehicle.

Like all portable diggers in the "Earth-Master" line, the DF-1 is designed for use with a "live boom" hydraulic derrick, such as the Series PM-1 "Pole-Master" shown. Down pressure which can be applied with the derrick teams up with natural feed of the auger to facilitate digging in extremely hard soil.

The DF-1 is powered by a hydraulic pump driven by the truck engine. Rotation is accomplished by a reversible hydraulic motor through a chain and sprocket assembly. Control lever, installed next to derrick controls in right rear compartment of body, is available with built-in engine speed regulator.

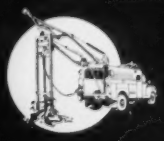
Standard full-flight auger, with Pengo head having replaceable points, can be furnished in sizes from 9" to 20" in diameter.

Complete details and prices are yours for the asking!

*Another reason why . . .*
*UTILITIES EXPECT MORE FROM*

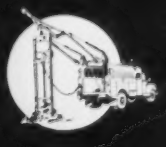
**POWERS** *American*

*UTILITY BODIES AND EQUIPMENT*



SERIES EM-1 "Earth-Master" digs holes from 9" to 20" in diameter, as deep as 9'4", vertically or at various angles. Auger is guided at all times . . . feeds and rotates under power.

SERIES EM-2 "Earth-Master" handles the work of a "fixed position" boring machine. Guided auger feeds and rotates under power. digs straight clean holes up to 30" in diameter . . . up to 10'6" deep, vertically or at angles.



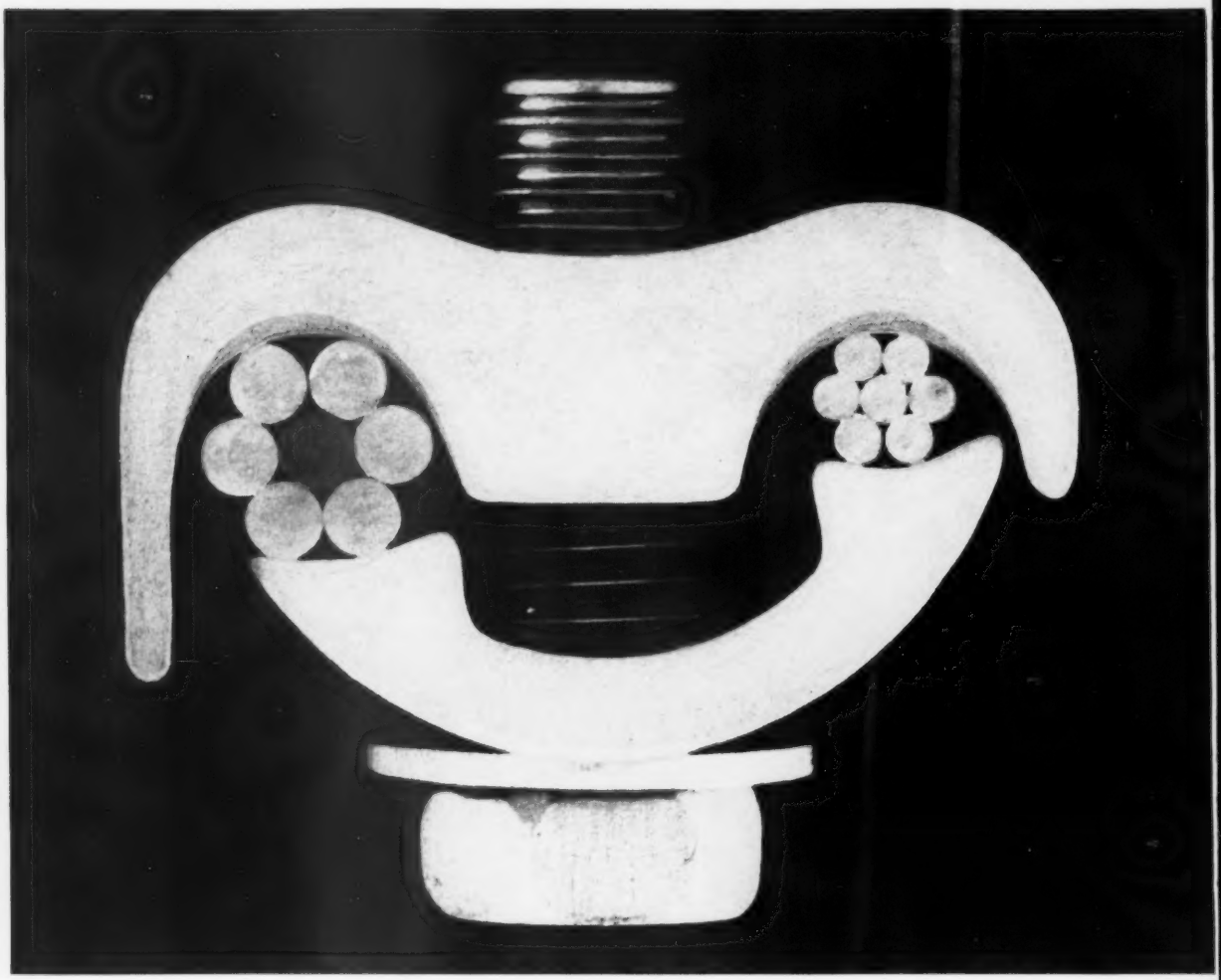
Save time and money . . . let our sales and engineering staff analyze all your truck body and equipment needs.

**McCABE-POWERS BODY COMPANY**

5900 NORTH BROADWAY · ST. LOUIS 15, MISSOURI

625 CEDAR STREET
BERKELEY 10, CALIF.

5525 S. E. 28TH AVE.
PORTLAND 2, OREGON



# NEW ALCOA CLAMP

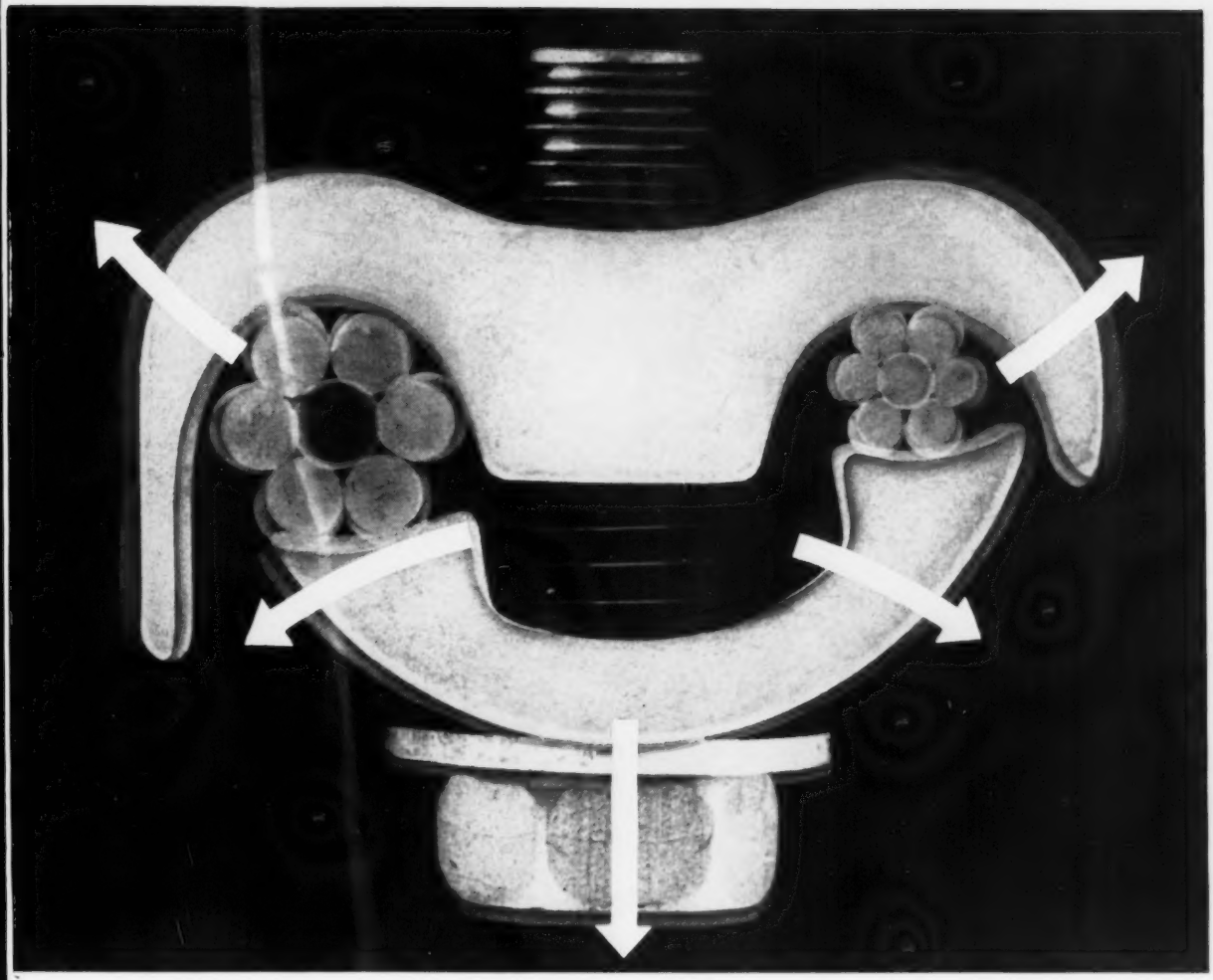
## Alcoa Clamps and Connectors Flex with Thermal Changes to Provide Safer, Longer Lasting Connections

Exclusive flexing-action design of Alcoa clamps and connectors gives good conductor contact regardless of thermal changes . . . eliminates the costly problems caused by excessive relaxation.

**Here's how this works:**

During normal, gradual temperature increases, excess pressure on the conductor is avoided by even expansion throughout the Alcoa clamp. Because Alcoa clamps and connectors are all-aluminum, including the bolt, all components have the same coefficient of expansion.

Alcoa clamps and connectors also adjust during



Above is a pictorial representation of the flexing action Alcoa clamps undergo during thermal changes in conductor. This automatic built-in protection, exclusive with Alcoa clamps and connectors, permits the clamp to "breathe" with changes in pressure.

# ACTUALLY "BREATHES"

current surges which cause sudden heating with insufficient time for temperature distribution. In these cases, the flexing action of the spring-like cap member and the stretch action of the aluminum bolt (which is three times that of steel hardware per unit of force) combine to ride with changing mechanical pressures. As cooling occurs, the Alcoa clamp *follows up*, retaining pressure to provide a stable electrical connection.

The entire line of Alcoa extruded clamps and connectors—both light and heavy duty—incorporates this exclusive flexing-action design principle. Why not ask an Alcoa sales engineer to show you what this unique feature can mean to you in terms of safer, longer lasting, maintenance-free installations. Aluminum Company of America, 2112-E Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value

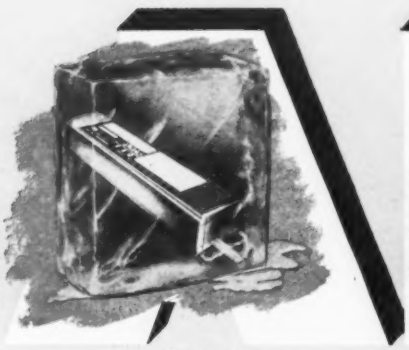
ALCOA ALUMINUM

For Exciting Drama
Watch "Alcoa Theatre," Alternate Mondays, NBC-TV, and "Alcoa Presents," Every Tuesday, ABC-TV

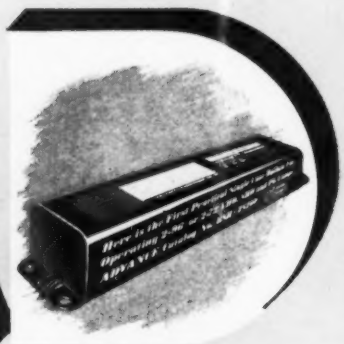
*For phone number of closest representative see advertising index in back of book.*

sts

from the world's largest exclusive fluorescent lamp ballast manufacturer



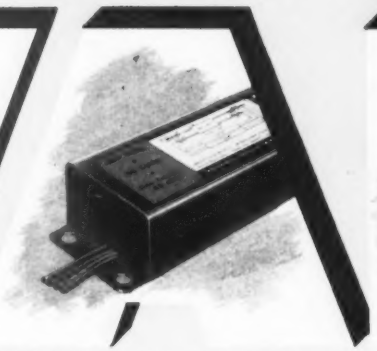
KOOL KOIL
FLUORESCENT LAMP BALLASTS



SINGLE CASE BALLAST
TO OPERATE VHO, SHO, PG LAMPS

ADVAN guard

THERMALLY ACTUATED
PROTECTIVE DEVICE



*VISA VOLT* COLOR CODED LABELS FOR
POSITIVE VOLTAGE IDENTIFICATON

INDIVIDUAL PACKAGING OF
FLUORESCENT LAMP BALLASTS

SEND FOR FLUORESCENT
LAMP BALLAST MANUAL

NATIONWIDE SERVICE
STOCKING DISTRIBUTOR PLAN

FLB SERVICE
WARRANTY PROGRAM

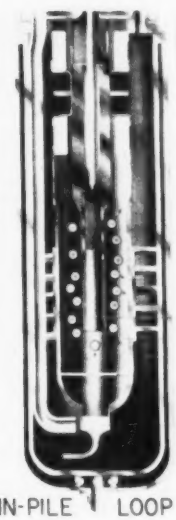
*"The Heart of the Lighting Industry."*

ADVANCE®
TRANSFORMER CO.
World's Largest Exclusive Manufacturer of Fluorescent Lamp Ballasts
2950 NO WESTERN AVE CHICAGO 18 ILL U.S.A.

*For phone number of closest representative see advertising index in back of book.*



# EW news roundup



IN-PILE LOOP TEST CELL

**ADVANCE** – The first direct conversion of nuclear reactor energy into electric power has been accomplished at the Los Alamos Scientific Laboratory.

The achievement was the result of an experiment with a "plasma thermocouple" placed in the core of a heterogeneous research reactor. Though it was calculated to produce enough power to light an electric bulb for a few minutes, the thermocouple actually operated at design efficiency for almost 12 hours before it was shut down and dismantled for analysis.

The device had an open circuit voltage of 3.8 v and a short circuit current between 30 and 40 amp.

The experimental plasma thermocouple resembles in size and shape an empty frozen fruit juice can. The source of power is a rod about ¼ in. in diameter and ¾ in. long containing enriched uranium. This is suspended in the center of the cell and surrounded by cesium gas. When the assembly is lowered into the core of a reactor, the neutron flux activates uranium fission heating in the center of the can, while the flow of reactor coolant around the outside of the can drops the temperature of the cesium plasma. The essential requirements of a thermocouple thus are met, and electricity is produced.

— EW —

**Five of the 14-man advisory council set up by EEI to help guide General Electric's project EHV are distinguished Western engineers. Congratulations to PG and E's Bill Johnson, Public Service of Colorado's Robbie Robertson, Southern California Edison's Joe Vivian, Los Angeles Department of Water & Power's Eddie Kanouse and BPA's Gene Starr. The undertaking hopes to evaluate transmission as high as 750,000 volts.**

—EW—

**OFFENSIVE** – AFL-CIO has established a speakers' bureau to reach college students in an all-out effort to organize engineers and scientists. This approach is being used because the union feels it has failed to organize the professionals because the National Society of Professional Engineers is "poisoning" the minds of engineering students against collective bargaining.

Harry P. Cooper of the NSPE said the group should retaliate with improvement of the present student contact program.

*(Or just stamp them out before they multiply.)*

—EW—

**TVA FENCED**—A bill approved by the House Public Works Committee would limit the service area of the Tennessee Valley Authority to the territory it served on July 1, 1957, except for economically feasible power exchanges existing prior to that date. A subsequent amendment, however, would permit TVA to go outside that area to serve eight specific towns if they desire to take TVA power.

The bill also would provide a $750 million limit on total bonded indebtedness of the TVA system.

**OUTSIDE VIEWPOINT**—Four steps to save American industry from a losing fight against foreign competition have been proposed by Samuel Lenher, a Du Pont company executive. He warned that foreign companies have demonstrated their ability to match our best efforts and have a competitive edge because of wage rates which are only a fraction of those in this country. His plan calls for:

1. A tax structure to encourage industrial growth and expansion.
2. National policies to encourage the modernization of industrial plants and increase their efficiency.
3. Strengthening of the patent system.
4. Tariffs applied selectively to place foreign-made products on an even footing with United States goods.

He said that undercutting of domestic producers would threaten the defense potential of the United

**Washington Water Power linemen, Len Porter (left) and Bill Littleton, prepare to lower a "tame" bobcat to the ground. While bobcats are not rare in the Palouse division of WWP, they rarely cause electrical outages. Apparently this one climbed the pole while being harassed by dogs**

## NEW One-Shot

### Hydraulic Knockout Punch Drivers

**punch holes for ½"-4" conduit**

**no pre-drilling or step-up punching**

Save many dollars on conduit installations with the new GREENLEE One-Shot Knockout Punch Driver. Lightweight, easy to carry, powerful! Fast one-man setup and operation. Deep 8" throat lets you position punch exactly where needed. High-strength aluminum "C" frame provides ample rigidity for slicing through 10-gauge steel with a few strokes of the hydraulic pump. No waste motions . . . fast, accurate work . . . better profits per job!

**two sizes**

**No. 1732** (above) fits all GREENLEE Knockout Punches and Dies ½" - 4". Weighs only 35 lb.

**No. 1731** (right) fits GREENLEE Knockout Punches ½", ¾", and 1" with special dies. Weighs only 15 lb.

Both models are used with GREENLEE hand- or power-operated hydraulic pumps. Ask your distributor for a demonstration, or write for descriptive bulletin E-292.

*A COMPLETE LINE OF KNOCKOUT TOOLS HAND-OR HYDRAULIC-PUMP OPERATED*

**GREENLEE TOOL CO.**
1763 Columbia Avenue
Rockford, Illinois

GREENLEE


States, restrict its scientific progress and reduce job opportunities for American workers.

—EW—

**ALASKANS PLEASE COPY**—Mink-lined toupees are now available at a Fifth Ave. wig salon in New York. The snap-in mink lining sells for approximately $100 but is guaranteed to keep the cold out for those with wide center parts.

—EW—

**SPENDING OUTLOOK**—Nationally, the privately owned electric utilities will probably spend 4% less this year for new capital equipment than they did in '58. One reliable source reports the spending program for the next five years to be as follows:

| | $ Billions | | $ Billions |
|---|---|---|---|
| 1958 Actual | 3.78 | 1961 | 3.64 |
| 1959 | 3.67 | 1962 | 3.95 |
| 1960 | 3.54 | 1963 | 4.00 |

Paradoxically, orders for heavy electrical equipment are at a low ebb at the present time.

ELECTRICAL WEST's annual survey shows that Western utilities will spend the same amount in '59 as they did in '58—$1,000,000,000.

—EW—

**Thomas M. Cole, president of Federal Pacific Electric Co., has donated $300,000 to the Newark College of Engineering for the establishment of a research foundation to assist the professional development of its graduate students and faculty instructing staff. The foundation's objectives are to provide more highly qualified graduate engineers and scientists, adequate numbers of qualified teachers in engineering colleges and better prepared science and mathematics teachers in the nation's high schools.**

—EW—

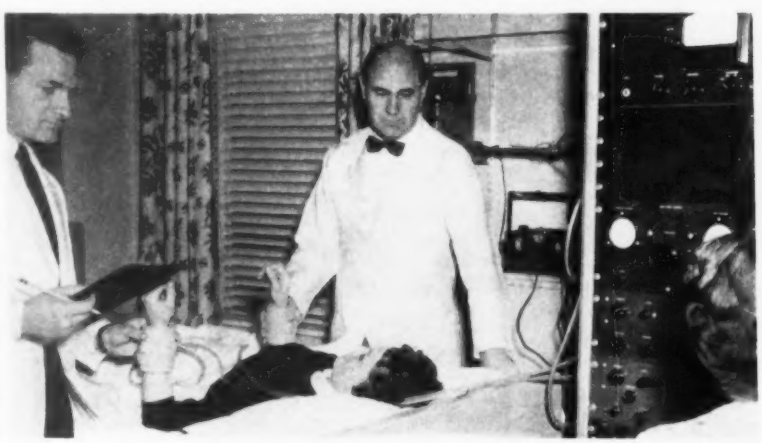
*General Electric Co. will now rent instruments in 55 of its service shops. Mainly for short term or emergency use, the company is providing a pool of 13,000 instruments of more than 70 types for fees that will range from $1 to $96 per month.*

—EW—

**LONGEVITY**—Surface failure of some metal seats and bearing surfaces on the slide gate installations of a federal dam in southern Idaho has triggered a search for more durable metal combinations.

The special research is under way at University of Idaho engineering experiment station, under a grant of $5,000 from the Walla Walla district of Army Corps of Engineers.

Vance Penton, University of Idaho engineering student, designed a measuring device that calibrates wear to 1/100,000 of an inch. Four



**Lockheed scientists have come up with an idea to use the same technique used to analyze the "heartbeat" radio signals from a missile in flight to detect early stages of the disease known as hardening of the arteries. Using sensitive magnetic tape and high-speed electronic computers, the scientists convert the sounds on the tape into mathematical terms, and then into points and lines on graphs through rapid computers. Preliminary analysis of this kind quickly shows abnormalities in suspected arteriosclerosis victims and indicates the severity of the disease if it is present**

*For phone number of closest representative see advertising index in back of book.*

# *Slam it closed "blind"...*

## this cutout never misses!

### The lineman doesn't have to steer the fuse tube into the contact of S&C's XS Cutout

If the lineman closes into a *fault* and misses—where is the lineman?

If he closes into a *load* and misses—what can the lineman do?

Even an experienced lineman shouldn't be expected to steer a cutout closed; for safety's sake, he must look away.

For positive steering when closing, the fuse tube of S&C's XS Cutout is controlled in four ways:

(1) The tube trunnion is thrust firmly forward into pockets in the hinge by the contact springs.

(2) The tube trunnion is simultaneously stabilized by the hinge's inner surfaces acting on the vertical faces of the trunnion casting.

(3) At the same time, guide edges of the hinge steady the corresponding edges of the lifting eye in the tube trunnion casting.

(4) LOADBUSTER® attachment hooks act as guides to steer the fuse tube as it "wipes in" and seats positively.

These four elements provide certain closing action, even when slammed home blind. And on dark and windy nights, closing is a sure thing, without hang-ups or damage.

For full information about the XS Cutout and its use with LOADBUSTER for load switching, write for Bulletin 511 to S&C Electric Company, 4425 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ont.

**S&C DISTRIBUTION CUTOUTS**

Disconnects • Cutouts • LOADBUSTER® • Interrupters
Metalclad Switchgear • Fuse Links • Power Fuses

CLAYTON MARK
ELECTRICAL CONDUIT

The Washington National Insurance Co. building at Evanston, Ill. used MARK Conduit
MARK Conduit used in Marshall Field's Old Orchard Shopping Center
MARK Conduit being installed in the New Trier High School, Winnetka, Ill.
Clayton Mark & Company's three brands of rigid steel conduit and "Electrictube" thinwall conduit are inspected and approved by Underwriters' Laboratories. The high quality, durable and easy-working characteristics have made MARK rigid and thinwall conduit "The Contractor's Favorite" for almost a half a century.
GALVAKOTE
ENAMELKOTE
ELECTRICTUBE

AVAILABLE EVERYWHERE
TO SERVE YOU!

**Associated Agencies, Inc.**
Boston 20, Massachusetts

**Brazill Brothers**
Linden, New Jersey

**Cary Chapman & Company**
New Orleans, Louisiana

**Cary Chapman & Company**
Greensboro, North Carolina

**Cary Chapman & Company**
Atlanta, Georgia

**Cary Chapman & Company**
Hialeah, Florida

**Cary Chapman & Company**
Birmingham, Alabama

**A. Lee Clifford & Company**
Indianapolis 7, Indiana

**Crescent Electric Sales Co.**
Chicago 47, Illinois

**Eberhardt Electric Sales Co.**
Buffalo 11, New York

**Electric Agencies**
Seattle 4, Washington

**Hodges & Glomb, Inc.**
San Francisco 3, California

**M. J. Pelletier Company**
Minneapolis 1, Minnesota

**Popkin Brothers**
Cincinnati, Ohio

**Popkin Brothers**
Cleveland 14, Ohio

**Popkin Brothers**
Detroit 1, Michigan

**Popkin Brothers**
Toledo, Ohio

**Jim Randall Company**
Dallas, Texas

**Rutkin Electrical Sales Co.**
Los Angeles 21, California

**The Schooler-Gorman Co.**
Kansas City 1, Missouri

**Wm. C. Welde & Sons**
Philadelphia 4, Pa.

**Randolph C. Wohltman Co.**
St. Louis 10, Missouri

**W. E. Young Company**
Denver 5, Colorado

*Since 1888, quality products for home and farm*

CLAYTON MARK
& COMPANY

1900 Dempster Avenue • Evanston, Ill.

*For phone number of closest representative see advertising index in back of book.*


other students are working with Penton, under the supervision of C. C. Warnick, assistant director of the research station.

—EW—

**TECHNOLOGICAL ADVANCES**—An Air Force-sponsored research development has resulted in the production of a high-speed electronic printer that can print 12 characters in parallel across a 5-in. chart at a speed of 2,160 characters per second. Beats a ball point all hollow.

The development of a longer turbine rotor blade will permit construction of a superpressure, cross-compound turbine of 800,000 kw capacity. This milestone was reported by Westinghouse Electric Corp.'s chairman, Gwilym Price, who addressed the recent Southwest Electric Conference at Chandler, Ariz.

Russia will put a 500-mile, 500-kv transmission system in service this year. This is a single-circuit line employing triple conductor bundles.

—EW—

**It had to happen sometime. A truck driver for the Public Service Co. of Colorado reported that he was hit by a hit-and-run woman driver. That would not be news except that the lady in question was driving an airplane and dented the top of the truck.**

—EW—

**NEW PUBLICATIONS**—The Federal Power Commission has issued the first annual supplement to its publication "Hydroelectric Plant Construction Cost and Annual Production Expenses." The first issue covered the years 1953 to '56 and the new supplement covers 1957. It may be purchased for 50¢ from the Government Printing Office, Washington 25, D.C. . . . Edison Electric Institute has announced publication of a 16-page digest of the recently published Gilbert Report. The title of the new booklet is "Summary of Economic Aspects of Single Complete Electric Service Compared With Dual Electric and Gas Service for Multiple Housing." It summarizes in nontechnical terms the information contained in the report compiled by Gilbert Associates Inc. of New York and is available from the Commercial Division of EEI, 750 Third Ave., New York 17, for $1 per copy. Discounts are offered on quantities of 100 copies or more.

**NEW BATTERY** — American Motors Corp. and Sonotone Corp. have teamed up to explore the possibilities of a revolutionary new electric automobile.

Recognizing that the chief drawback of the present electric automobile is the need for recharging batteries after less than 100 miles of travel, the project is aimed at developing an electrical power plant that would be constantly recharging during operation by a generator operated from a small high-performance engine. A sintered-plate, nickel-cadmium battery, like those used in missiles and jet aircraft, will provide propulsion energy.

This type of battery, although very compact, is more costly than standard batteries but can withstand great overloads or surges of power and can be recharged in a fraction of the time of the conventional battery. Such a battery is expected to last the life of the electric auto.

—EW—

*Pacific Power & Light's group medical - hospital insurance administrators were slightly shaken when they received a claim for 153,471 francs. It turned out that a retired PP&L employee, E. L. Bennett of Lander, Wyo., had required surgery while visiting in Paris. George C. Hein, who handles claims for the PP&L plan, wrote out a check for $314.63 to cover the claim.*

—EW—

*The plutonium recycle test reactor project at Hanford is well under way. The $15 million reactor with associated $4 million fuel fabrication plant, if successful, will demonstrate that a system recycling the plutonium generated in its own operation will be able to produce three or four times as much power from a given quantity of natural uranium as would be possible without recycling.*

—EW—

*Another reactor concept of considerable interest to the industry achieved criticality on Feb. 26. The reactor, dubbed LAPRE II, is designed to produce superheated steam in one simple operation. The tests will determine the feasibility of a reactor using a solution of enriched uranium phosphate, phosphoric acid and water as a fuel.*

**Subox Has a Paint For Every Need**

If it's a steel tower, for power transmission or any other purpose, there are Subox paints for every protective and decorative requirement.

SUBOX are the only paints in the United States made with *suboxide of lead*. After drying, Subox continues to be chemically active to form a strong, impervious film. A single coat of Subox usually lasts five to eight years even under severe weather conditions.

SUBOX "600" SERIES contains an epoxy resin for increased chemical, alkali and water resistance. Gives added protection against corrosive fumes and extremes in temperature changes.

GALVANOX, with a high content of special metallic zinc, provides an electro-chemical type of protection. Not to be confused with ordinary zinc oxide paints, it is superior for reconditioning damaged galvanized surfaces.

AEROX is the name used to distinguish the orange and white Subox-made paint used for towers near airfields. It holds its brilliant visibility well under all conditions.

**Write today for descriptive literature and color card.**

SUBOX PAINTS

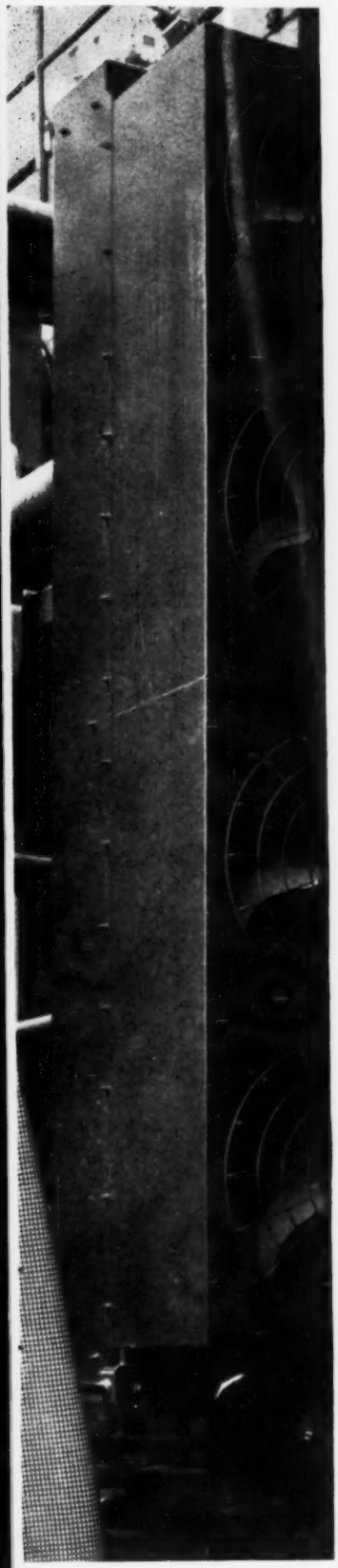
Subox Inc.

*Established 1924*

18 Fairmount Plant, Hackensack, New Jersey
Subox Company of Canada, Weston, Toronto 15

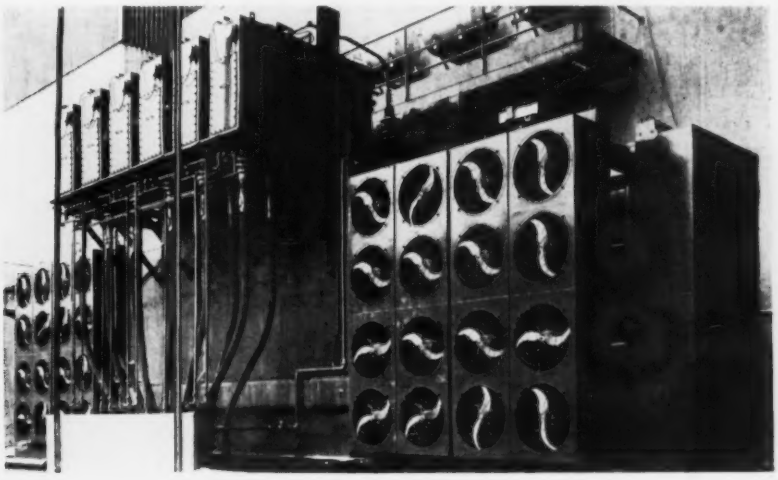

*For phone number of closest representative see advertising index in back of book.*

*For phone number of closest representative see advertising index in back of book.*



Mr. S. Bennon, Manager, Westinghouse Large Power Transformer Engineering, and Mr. J. D. Goodwin, Large Power Transformer Sales, examine drawing of world's largest generator transformer, installed at Commonwealth Edison's Fisk Station.

Rated at 69 kv, 380 mva, FOA, this Westinghouse power transformer has two 69-kv windings, each rated at 210 mva, and one 17.2-kv winding rated at 380 mva.



# WORLD'S HIGHEST INSTALLED CAPACITY

At 380 mva, the Westinghouse generator transformer at Commonwealth Edison's Fisk Station has the highest capacity of any such unit installed.

Here is another step upward toward the super kva banks of tomorrow . . . another step made possible by Westinghouse leadership in power transformer development.

Through the years, Westinghouse design engineers have developed improvements that permit building—and shipping—the higher capacity transformers required by higher and higher generation capacity. Here are some of these developments, and what they mean to the future of electric utilities:

**"Form-Fit" construction**—Highest mechanical and dielectric strength, to withstand all stresses of shipping, installation and service. Smaller, lighter transformers.

**Forced-oil cooling**—Increased cooling efficiency, greater capacity from a smaller transformer.

**Inner-Cooled construction**—Maximum utilization of materials used in conventional transformer construction reduces size and weight up to 15%, permits lower impedances and improved performance.

**Insuldur* insulation system**—Permits an extra 10% overload beyond your present loading practice with no additional loss of insulation life.

And here are other dollar-saving Bonus Values from Westinghouse Plowback of Earnings into research and development. Lower BIL's with savings in original cost, reduced losses, lower impedance and smaller size; vapor cooling, which combines the safety of dry-types with performance of liquid-immersed units.

*Trade-Mark J-70877

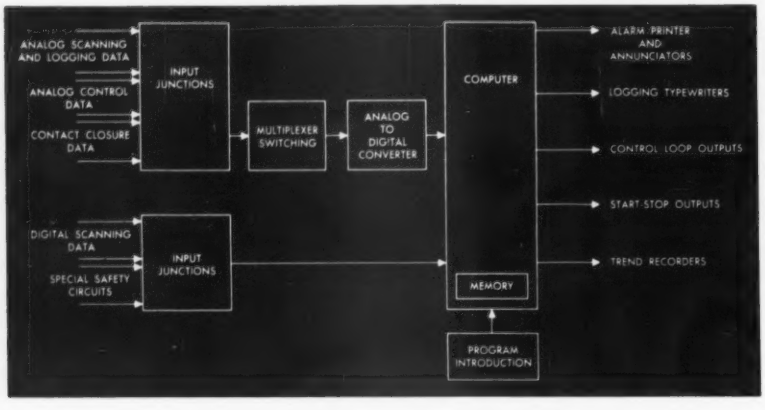
YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

# PRODUCT NEWS

## New Designs and Applications

### Computer Control for Power Plant




An electronic computer control system developed by Daystrom Systems will be used in the first fully automatic electric power generating station.

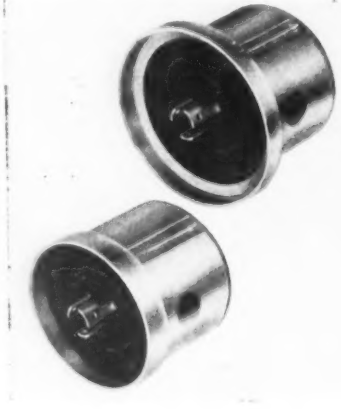
The computer will control startup and shutdown of the station, with startup requiring 4½ hours. The plant will go off the line immediately upon pushing the shutdown button. The computer controls each of the some 800 steps involved in starting or shutting down and, between each of the 800 steps, it scans 700 different temperatures, pressures, flow rates and valve and switch positions.

Information presented to the computer for evaluation is in the form of electrical energy—at signal levels less than one-tenth the strength of human brain waves. When the computer puts the station on the line, it automatically reprograms itself and goes into operational mode. It runs the plant by automatic combustion control, steam temperature control, feed water control and spray control (overriding steam temperature control—a safety feature).

The computer scans all inputs for over- or under-limit operation. If such is found and cannot be corrected by the system, visual, audible alarms and special print-out tell the operator exactly which point and how far it is off limits.

The unit has continual microwave contact with the main dispatching office. Within one second of a command from the dispatching office, the computer can increase or decrease station output, and the proper action is taken simultaneously on all operating loops. To monitor the plant equipment for safe operation, the computer system selects each input variable in accordance with the requirements set forth in the computer program. It accepts the basic measured information in digital form from an analog-to-digital converter. The fully automatic control system will cost only 2.5% more than for a semiautomatic system.

(1) *Daystrom Systems, La Jolla, Calif.*



### Photoelectric Control

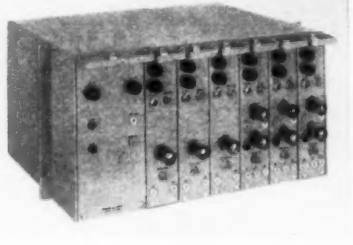
(2) *Ripley Co. Inc., Middletown, Conn.*

Isolation of three-prong plug terminals with a phenolic base design in this new photoelectric control is said to have exceptional resistance to "arc-over" damage created from induced voltage surges. A control will fit mercury or filament design hoods and is engineered to conform to EEI-NEMA specifications. The basic control is also available with a larger cover skirt housing designed for use with existing luminaires not conforming with EEI-NEMA standards. The unit is tubeless.

### Gas Turbine

(3) *General Electric Co., Schenectady 5, N. Y.*

Rated 20,500 kw under normal conditions, a new peaking gas turbine has been designed for installation as a complete generating station compatible with standard electric utility practices. The new unit operates with a firing temperature of 1,600 F and is designed to burn either natural gas or distillate oils. It will drive a 25,600-kva, 13,800-v air-cooled generator. A unit can be installed in a building some 28 ft wide and 98 ft long. The unit can be supplied with supervisory controls for remote starting and stopping of the gas turbine, as well as telemetering equipment to relay performance and operating data to central power generating stations.

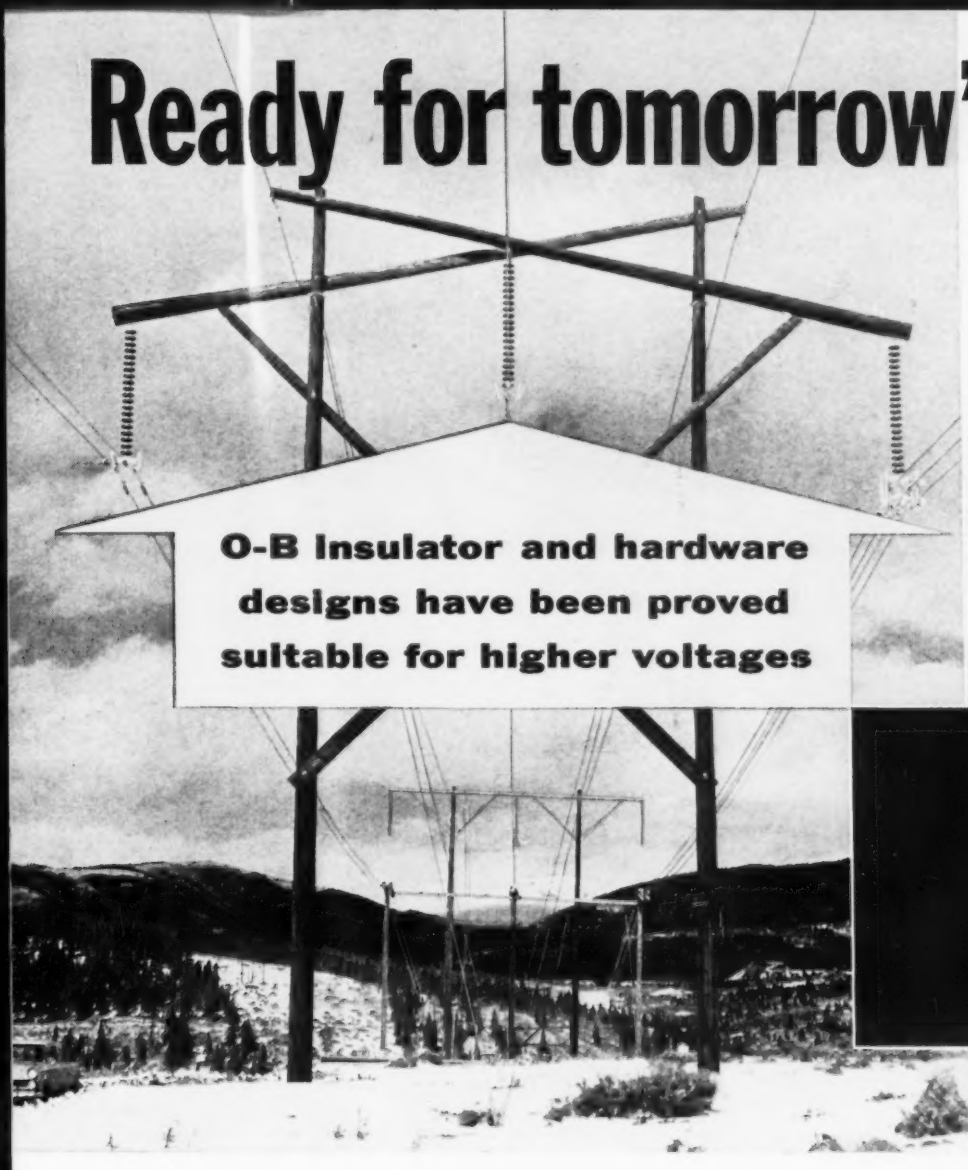


### Code Transmission System

(4) *Lynch Carrier Systems Inc., 695 Bryant St., San Francisco, Calif.*

A new code transmission system for telemetering, remotely controlled alarm circuits and similar requirements is being marketed by this company. Called the B-700, it includes

# Ready for tomorrow's EHV!



**O-B insulator and hardware designs have been proved suitable for higher voltages**

Suspension assembly for quadruple 1.40-inch bundle conductor test line, shown on test in O-B laboratory above, shown installed on test line at left.

400-kv? 550? 600? One, two, or four conductors? You make the choice as to what will serve your needs best when you plan an EHV line. You need not be limited in your thinking by hardware and insulator designs. Proved designs are already available. Some have served successfully for as many as seven years on 345-kv lines. Other designs to fit your specific requirements can readily be developed.

For higher voltages and multiple conductor bundles, optimum arrangements of insulators, clamps and shielding devices have already been proved in laboratory testing. It's significant that the clamps and insulators are of standard O-B design. The inexpensive shielding devices are modifications of designs now in service on 345-kv lines.

So as you make your EHV plans, keep this in mind. Laboratory facilities, design experience, manufacturing technique and the actual insulators and hardware designs themselves are available to meet the requirements of extra-high voltage transmission lines.

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

**Ohio Brass** (B) HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

*For phone number of closest representative see advertising index in back of book.*

4981-H

# PVC ROYALOK

Caps and Connectors interlock with a twist of the wrist . . . give you rugged, positive, fail-proof power connections.

**Unbreakable molded vinyl bodies**—can't crack, chip, or break . . hold blades and contacts solidly in place. Resistant to acid, oil, and grease.

**Safer, stronger construction**— Dead-front caps eliminate nuisance of fiber washers and dangers of exposed conductors. Internal barriers separate conductors. One-piece connectors have heavy brass double-wipe contacts locked in solid vinyl

**ORDER FROM YOUR WHOLESALER, OR WRITE FOR CATALOG 2-58-4.**

**A Broad Line of ROYALOK Interlocking* Devices**

| 2-Wire Polarized | 3-Wire Polarized Grounded | 4-Wire Grounded |
|---|---|---|
| 10 Amp — 250V | 10 Amp — 250V | 20 Amp — 250V |
| 15 Amp — 125V | 15 Amp — 125V | 10 Amp — 600V |
| 20 Amp — 250V | 20 Amp — 250V | Dead-front caps . . . one-piece connectors |
| Dead-front caps . . . one-piece connectors | 10 Amp — 600V | |
| | Dead-front caps . . . one-piece connectors | |

*Fit all standard interlocking devices

**QUICK, CLEAN WIRING 3 Simple Steps!**

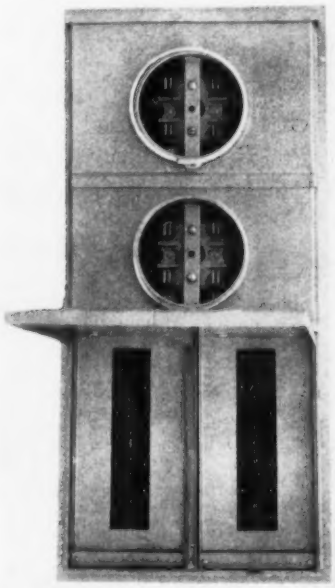
1. Remove cord grip plate by loosening plate screws (they can't fall out).
2. Insert cord thru clamp, strip conductors and connect to terminals.
3. Replace grip plate, tighten screws — that's all!

ROYAL ELECTRIC ...an associate of

**ROYAL ELECTRIC CORPORATION**
PAWTUCKET, RHODE ISLAND

**SALES REPRESENTATIVES AND WAREHOUSES: Los Angeles**—1950 Naomi Avenue, RI 7-9655; **San Francisco**—1225 Sixth St., HE 1-5792; **Seattle**—4130 First Ave., So., MA 3-8882; **Denver**—888 S. Lipan Street, WE 6-3456


equipment for transmission of On-Off pulse code or varying frequency information. Systems may be selected with relay or electronic keying. Six transmitters or receivers plus a power supply occupy only 8¾ in. of vertical space in a standard 19-in. relay rack.



## Duplex Meter Panel

(5) *BullDog Electric Products Co., 2885 E. Washington Blvd., Los Angeles, Calif.*

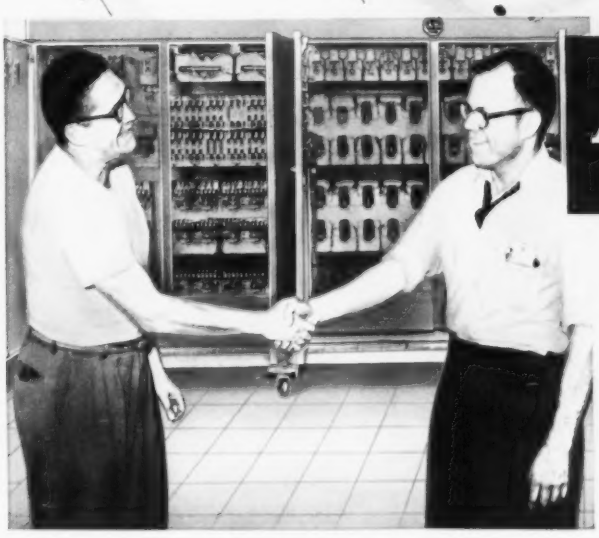
Load wiring barriers for branch wiring out the top, as well as connections out the bottom, are features of this new duplex meter combination panel. The semiflush unit is 14 in. wide and 30 in. long and may be installed between studs. House power units of the series contain 200-amp main lugs feeding two meters. From each meter, in turn, may be fed various combinations of interior units. Illustration is of a dual arrangement of 100-amp main breaker and 12 branches.

## Corrosion Inhibitor

(6) *Fargo Mfg. Co. Inc., 845 Main St., Poughkeepsie, N. Y.*

This company has developed a new grit bearing corrosion inhibitor for aluminum and aluminum-to-copper connections. It is said to be nonconductive and will not establish a potential tracking path on hot sticks or other protective equipment.

# Precision Guidance of Nearly a Mile of Plate Glass...



A series of control panels such as this is used in the Pittsburgh Plate Glass cutting room. Above are shown the Allen-Bradley engineers after completing the factory testing of the final panel.

## controls by ALLEN-BRADLEY of course!

The New Pittsburgh Plate Glass Plant at Cumberland, Maryland, heralds a new era in the art of plate glass making. Night and day, a continuous ribbon of glass is fed to a nearly mile-long process line. Then a complex control system directs the automatic cutting, sorting, and conveying of the glass to six areas, according to a continuously varying program.

Special control panels which integrate portions of this equipment into a unified, smoothly operating system were designed, developed, and engineered by Allen-Bradley. You can benefit by this extensive control experience . . . it is a "plus" value when you specify Allen-Bradley *quality* motor control.

Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

See on the next page how A-B Controls do it...

PAWTUCKET, RHODE ISLAND

**SALES REPRESENTATIVES AND WAREHOUSES:** **Los Angeles**—1950 Naomi Avenue, RI 7-9655; **San Francisco**—1225 Sixth St., HE 1-5792; **Seattle**—4130 First Ave., So., MA 3-8882; **Denver**—888 S. Lipan Street, WE 6-3456

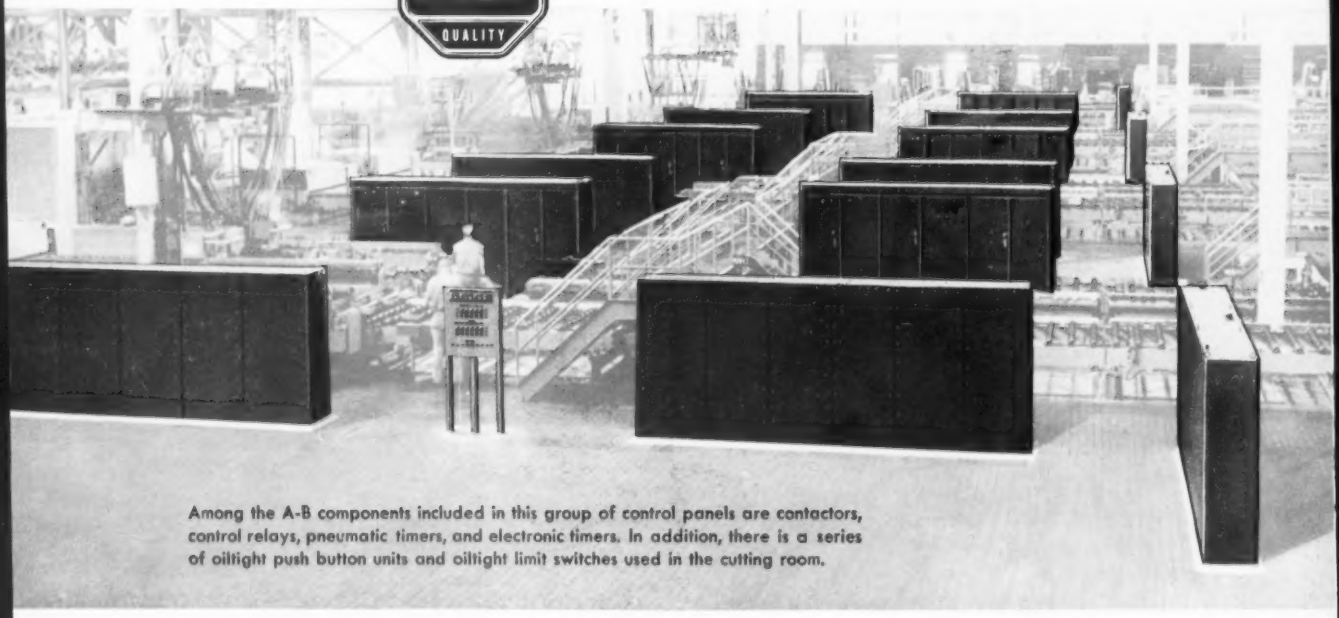
or other protective equipment.

# Plate Glass made by the mile

## with reliable ALLEN-BRADLEY Controls

A-B QUALITY

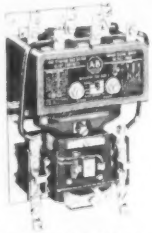
In the cutting room at Pittsburgh Plate Glass (below), Allen-Bradley controls prove the reliability of their "simple design." All A-B solenoid starters, contactors, and relays have only ONE moving part . . . assuring *millions* of trouble free operations. There are *no* bearings or jumpers to cause trouble. Contact maintenance is also eliminated—A-B double break, silver alloy contacts remain in perfect operating condition until completely worn away. Insist on Allen-Bradley *quality* motor controls . . . you cannot do better!



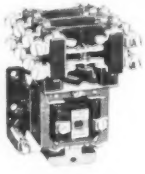
Among the A-B components included in this group of control panels are contactors, control relays, pneumatic timers, and electronic timers. In addition, there is a series of oiltight push button units and oiltight limit switches used in the cutting room.

### Some of the standard components which are used in this plant

**Contactor**—Bulletin 702, Size 3 shown. Made up to Size 8, rated 1350 amps, 220-550 v.



**Solenoid Starter** Bulletin 709, Size 2 shown. Made in ratings to 450 hp, 220v; 900 hp, 440-550 v.

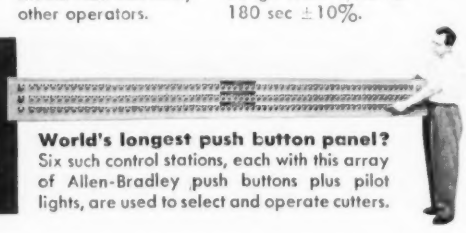


**Control Relay**—Bulletin 700. Universal type relay with both N.O. and N.C. contacts shown.

**Limit Switch**—Bulletin 802T. Oiltight roller lever type shown. Also with many other operators.

**Pneumatic Timer** Bulletin 849 for on-delay or off-delay. Range from 1/20 to 180 sec ±10%.

# ALLEN-BRADLEY
## Quality Motor Control



**World's longest push button panel?** Six such control stations, each with this array of Allen-Bradley push buttons plus pilot lights, are used to select and operate cutters.

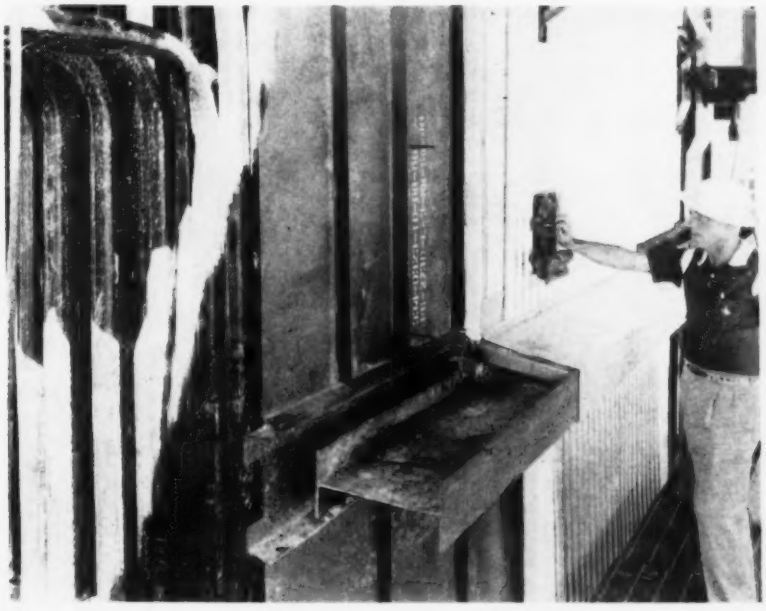
Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

5-59-MR

See on the next page how A-B Controls do it...
5-59-MR



## New Procedure for Aluminum Lagging

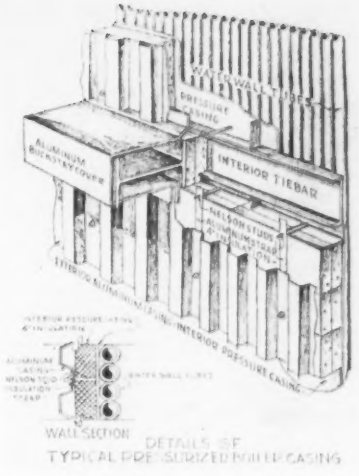


A new technique for applying aluminum lagging to the insulation protecting the steel inner casing of power plant boilers has been developed by Ralph A. Withrow of Stearns-Roger Mfg. Co., Denver. The new procedure brings the cost of aluminum lagging to that of steel lagging applied by conventional methods, it is reported.

The technique involves the use of Nelson arc-welded studs and aluminum insulation straps. Studs are installed on the steel inner pressure casing of the boiler, block-type installation impaled on the stud, aluminum insulation straps impaled over the insulation, and a speed clip used to secure strap and insulation to the casing. Final step in application of the aluminum lagging involves impaling the sheet on the stud, and fastening the entire assembly with the standard aluminum cap supplied with the stud. No special tools are needed, and one stud provides adequate anchorage for the complete insulation-lagging assembly.

Insulation and lagging may be removed intact to permit repair or replacement of the boiler tubes. Most of the material is suitable for re-installation after removal.

Benefits from the use of aluminum lagging include lower maintenance costs, improved appearance, it needs no paint, it is lighter, and there are some insulating and heat transfer properties that reduce operating skin temperatures on the outside of the boiler.




(7) *Aluminum Co. of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.*

## Interchangeable Bushings

(8) *Federal Pacific Electric Co., 50 Paris St., Newark 1, N. J.*

A new line of high-voltage bushings, rated 115, 138, 161 and 196/230 kv, each interchangeable between oil circuit breakers and transformers, is announced by this company. The bushings are an oil impregnated condenser type. Five basic models are available: 69 kv, 2,000 amp for oil circuit breakers; 115 kv, 1,200 amp and 1,600 amp for oil circuit breakers and transformers; 138 kv, 1,200 and 1,600 amp for oil circuit breakers and transformers; 161 kv, 1,600 amp for oil circuit breakers and transformers; and 196 kv, 1,600 amp for oil circuit breakers and transformers.

## Open Cutout

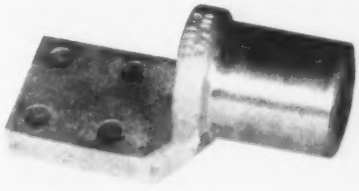
(9) *Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.*

A new open cutout for distribution system voltages of 14.4 kv to 24.9 kv and wye systems up to 34.5 kv is available from this company. A nonferrous, single insulator, crossarm mounting type, the new cutout is supplied with a solid cap on the fuseholder and interrupts 2,000 amp. With an expendable cap on the fuseholder, the unit interrupts 6,000 amp. Both the standard fuseholder and the loadbreak fuseholder are available.

## Capacitor Blocks

(10) *Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.*

Factory-assembled capacitor blocks offered by this company have been designed for use with 100-kvar units in open-type banks at transmission, subtransmission and distribution voltages. A standard block consists of two rows of 100-kvar capacitor units, 5-kv or 8.7-kv class, connected in parallel and mounted in a welded aluminum frame of standardized dimensions. Individual fuses in bus-mounted cutouts protect the units. A complete line of accessories is available, including base support insulators.



## Welding Fittings

(11) *Royal Electric Mfg. Co. Inc., 1122 E. 87th St., Chicago 19, Ill.*

Aluminum welding fittings offered by this company provide an internal support for pipe and are engineered

In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

5-59-MR

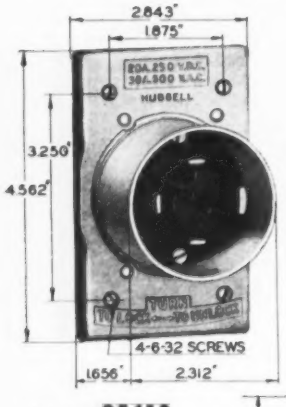


IT PAYS TO HAVE HUBBELL GOOD CONNECTIONS

30 AMPERE

5-WIRE

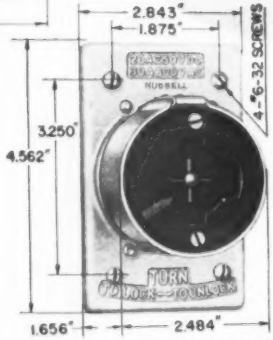
Hubbellock®



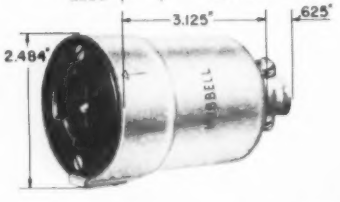

*a complete new line of "Hubbellock" devices designed for 4-wire applications requiring additional equipment ground*

Cat. No. **25418**
**Male Receptacle with metal housing**

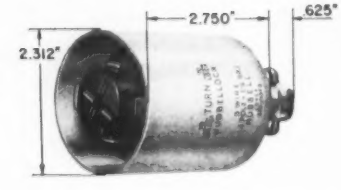
Cat. No. **25403**
**Female Receptacle with metal housing**




Cat. No. **25414**
**Armored Connector Body**




Cat. No. **25415**
**Armored Male Cap**



**HARVEY HUBBELL, INCORPORATED**

BRIDGEPORT 2, CONNECTICUT

WIRING DEVICE OFFICE AND WAREHOUSE LOCATIONS

Bridgeport 2, Connecticut
State and Bostwick Streets

Chicago 7, Illinois
37 South Sangamon Street

Los Angeles 12, California
103 North Santa Fe Avenue

San Francisco, California
1675 Hudson Avenue

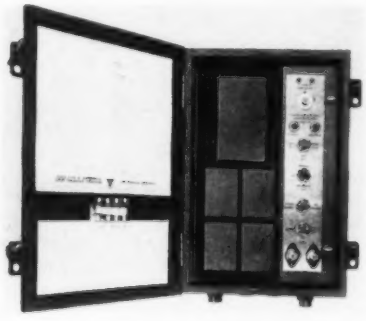
IN CANADA:
Scarborough, Ontario,
1160 Birchmount Road

to provide maximum strength and conductivity. Connector projections have been eliminated wherever possible to minimize corona.

## A-C Test Sets

(12) *General Electric Co., Schenectady 5, N. Y.*

A new line of high voltage a-c test sets used for applying dielectric tests to all types of electrical apparatus is offered by this company. Self-contained in an upright all-steel cabinet, the test sets are available in four standard ratings, 20,000 to 50,000 v and 2 kva (one hour). Although basically designed for stationary equipment, the high-voltage sets can be converted for use as mobile units.



## Load Transfer Control

(13) *Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.*

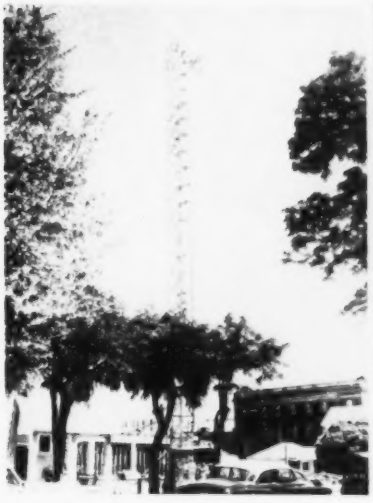
An improved single-phase control for automatic transfer of important loads from one distribution line to another is now available from this

ating skin temperatures on the outside of the boiler.

circuit breakers; 115 kv, 1,200 amp and 1,600 amp for oil circuit breakers.

by this company provide an internal support for pipe and are engineered

company. The control features easy selection of various operating sequences, enclosed relays, dead-front construction, and a hinged panel for quick access to internal wiring. It is intended for use with Kyle type NR or VR oil switches, type B or W reclosers, circuit breakers or other switches.



### Microwave Test Tower

(14) *Up-Right Scaffolds*, 1013 *Pardee St., Berkeley* 10, *Calif.*

This 150-ft aluminum tower for microwave pat-testing can be erected by six men in 1½ days. The aluminum tower is composed of 6-ft folding sections stacked up to the required height. It is easily disassembled for survey at a new site.

### A-C Voltmeter

(15) *Motorola Communications & Electronics Inc.*, 4501 *W. Augusta Blvd., Chicago* 51, *Ill.*

This company is entering the field of electronic instrumentation with a new all transistorized battery operated a-c voltmeter. The unit has full scale readings of 1 mv to 300 v in 12 ranges with an essentially flat fre-

FEATURING A COMPLETE LINE OF SERVICE AND MAINTENANCE BODIES

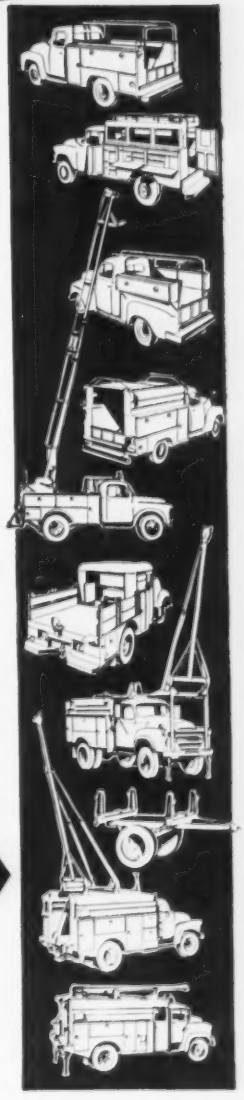
**The SERIES S-X SERVICE BODY features both front and rear VERTICAL door arrangement to utilize every inch of Body space.**

The design of the SERIES S-X Compartment layout purposely encourages the storage of heavy material ahead of rear axle and lighter equipment in the rear. Rear vertical compartments are supplied with hooks to provide hanging of ropes, belts, and climbers. Horizontal and front vertical compartments contain material shelves, parts bins, and adjustable trays for storage of heavier tools and supplies on top of and ahead of rear axle. SERIES S-X SERVICE BODY provides three or more large compartments completely eliminating small, useless catch-all compartments or deep wells.

**OUTSTANDING FEATURES INCLUDE:**

- Double mouldings around all door openings providing doors with triple sealing action keeping compartments water tight.
- Rub Rail to protect sides of body.
- Drip mouldings above all doors.
- Chains supplied so that horizontal door provides a horizontal work table when open.
- Precise workmanship and careful finishing result in equipment on which you are proud to display your name.

Tell us your problems. Utility Body's Custom Design Service solves them by building to your requirements without additional cost.



**COMPLETE LINE**

There IS a UTILITY BODY to fulfill YOUR OWN Specific Requirements! Contact UTILITY BODY COMPANY for data on the SERIES S-X SERVICE BODIES or telephone your nearest distributor for complete information on UTILITY BODIES.

**UTILITY BODY CO.**

1530 WOOD STREET • OAKLAND 7, CALIFORNIA • TWINOAKS 3-8980


*For phone number of closest representative see advertising index in back of book.*

37 South Sangamon Street

1675 Hudson Avenue

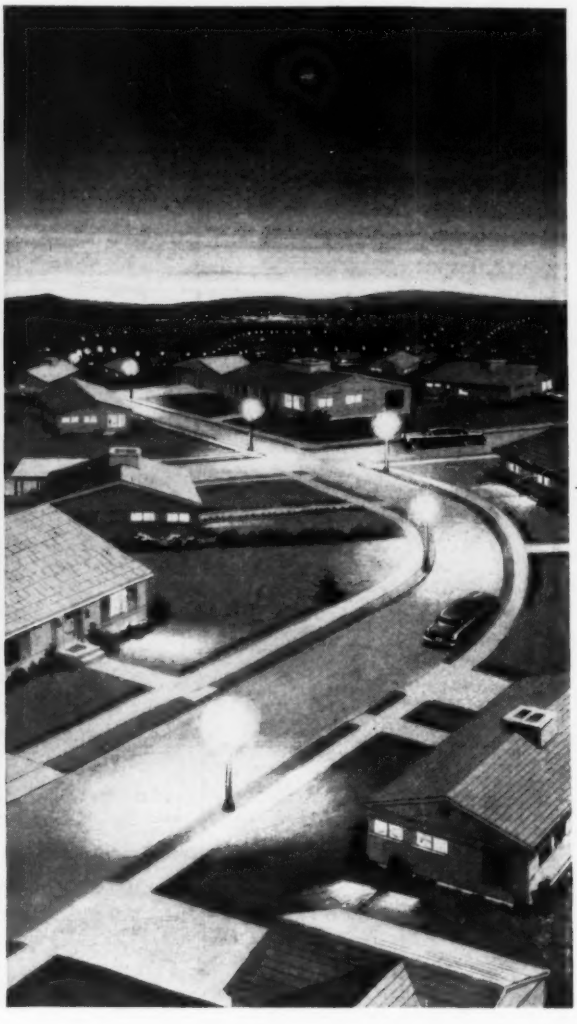
1160 Birchmount Road

another is now available from this

*For phone number of closest representative see advertising index in back of book.*




# TRIANGLE has a cable for every STREET LIGHTING SYSTEM



Each street lighting job has different requirements calling for a specialized type of cable. Triangle has four basic types—each designed to handle a specific set of service conditions. The distribution engineer can select the *one right kind* for his situation, eliminating costly overdesigning and preventing system outages due to underdesigning.

* Triozone insulated, Trioprene sheathed—Series Street Lighting Cable. Single conductor cable for direct burial and duct installation. 2001 to 5000 volts.

* Rubber insulated, lead sheathed—Series Street Lighting Cable. Single conductor cable, available with or without double steel tape armor. 0 to 5000 volts.

* Trioseal or Triolene insulated—Series Street Lighting Cable. Single conductor cable. Extra thickness of insulation available for severe service. 0 to 5000 volts.

* Trioseal insulated, Triolene sheathed—Pole and Bracket Cable Twin conductors. 4001 to 10,000 volts.

*These cables are described in a new bulletin, just off the press.*
*Write for your copy.*

**TRIANGLE CONDUIT & CABLE CO., INC.**

NEW BRUNSWICK, NEW JERSEY

"It MUST Be Right!"


*For phone number of closest representative see advertising index in back of book.*

ranges with an essentially flat fre-

1530 WOOD STREET • OAKLAND 7, CALIFORNIA • TWINOAKS 3-8980

*For phone number of closest representative see advertising index in back of book.*



quency response of 20 cycles to 1.5 mc. It has a db scale and a "battery o.k." scale. The power supply of standard batteries provides more than 400 hours of operation, according to the company. The unit weighs about 5 lb.

## Telescoping Boom

(16) *I. M. Division, Peters Co., 1933 S. E. Union Ave., Portland 14, Ore.*

This company offers a new hydraulically operated telescoping boom and aerial platform. The standard model reaches 40 ft 9 in., giving an average working height of 48 ft. It is designed to be mounted on 16,000 lb or heavier truck chassis and does not require outriggers. Movements are actuated by double acting hydraulic cylinders, and the work platform is automatically kept level by a double acting cylinder at its base. Movements are controlled from the platform or truck.

## Plastic Conduit

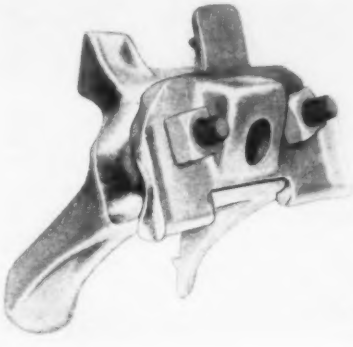
(17) *Franklin Plastics Inc., Franklin, Pa.*

A new lightweight plastic conduit weighing about one-eighth as much as steel pipe is available from this company. Solvent-welded connections are made at the site by applying a thin layer of cement with a brush.

## Power Connectors

(18) *Delta-Star Electric Division, H. K. Porter Co. Inc., 2437 Fulton St., Chicago, Ill.*

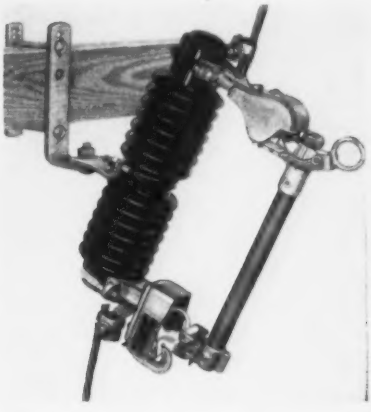
A new line of power connectors for voltages above 161 kv, and designed to assure corona-free service, is offered by this company. Features include recessed bolt heads, tapped holes eliminating nuts and protruding bolt ends, rounded corners and edges of all castings, and no sharp contour changes in cross sections. Available at present in several sizes of the standard Tee connectors in both bronze and aluminum.



## Aerial Cable Clamps

(19) *Malleable Iron Fittings Co., Branford, Conn.*

This new line of aerial cable suspension clamps is for attaching aerial cable to wood poles. MIF clamps have two basic pieces: spacer body and clamp plate. A generous lip below the messenger groove in all models is said to assure positive support of the messenger. A stringing finger facilitates stringing the messenger for field spun aerial cables. Each clamping plate has a second groove to accommodate an optional ground wire. Three sizes are available.



## Cutout

(20) *A. B. Chance Co., Centralia, Mo.*

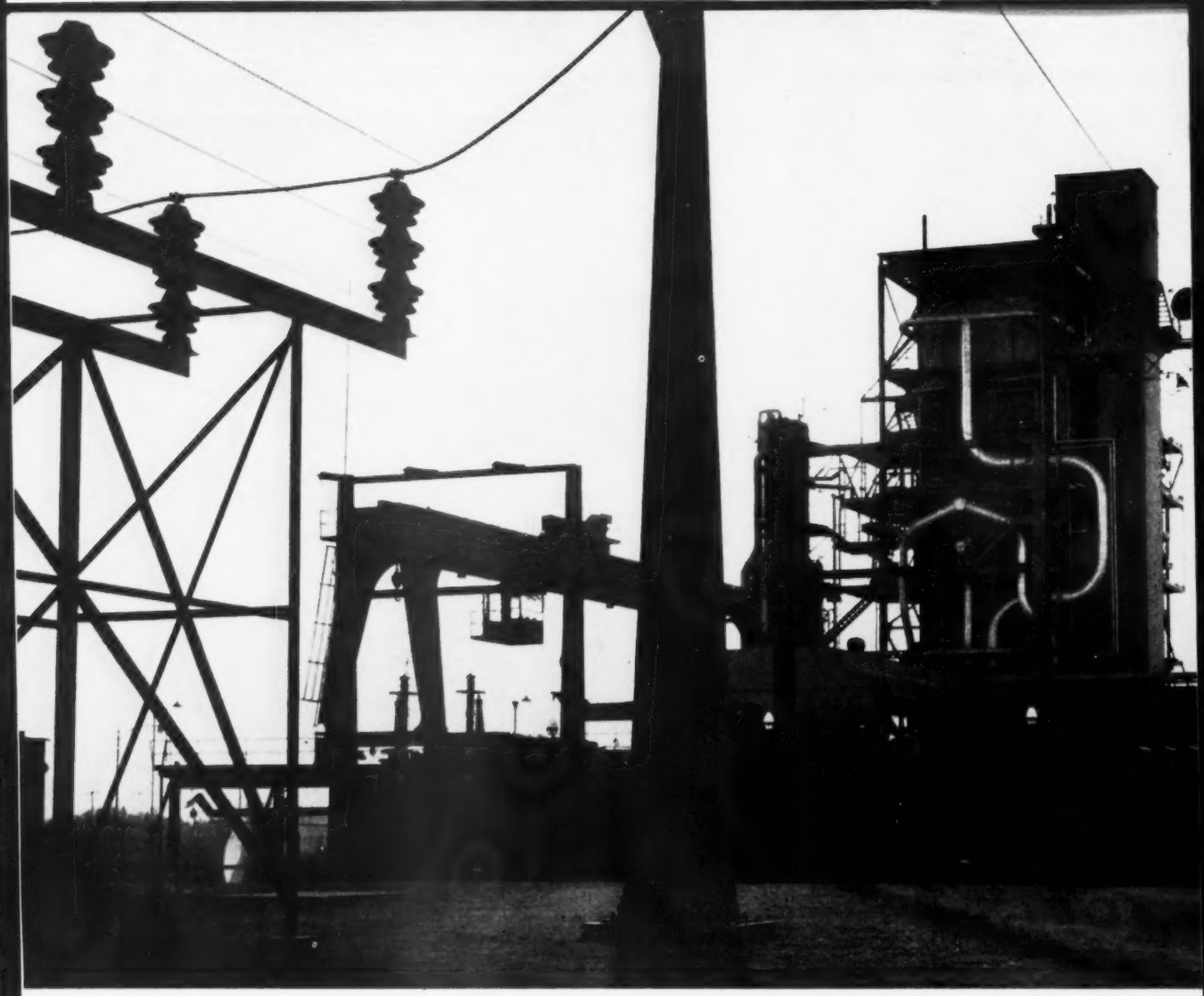
Available now from this company is a new drop-out open-type cutout designated type F2. Features are extensive use of bronze, parallel-groove-design terminals and expendable caps. It is available in 5.2-, 7.8- and 15-kv ratings; 100- and 200-amp ratings. Interrupting capacities range from 4,000 to 12,000 amp. Fuse holders can be equipped with expendable caps or interchanged to meet increasing system short circuit capacity.

## New Developments

► **General Electric** Co. now offers semiburied transformer enclosures for underground distribution systems in a "package" that includes transformer and two enclosed disconnects.

► **Westinghouse Electric** Corp. has designed a 230-kv, 15,000-mva sulphur hexafluoride circuit breaker. The company reports that the use of sulphur hexafluoride gas makes it possible to design a breaker that combines the best features of insulating oil and compressed air designs.

**For manufacturer's bulletins with additional information on these products, fill in coupon on page 26.**

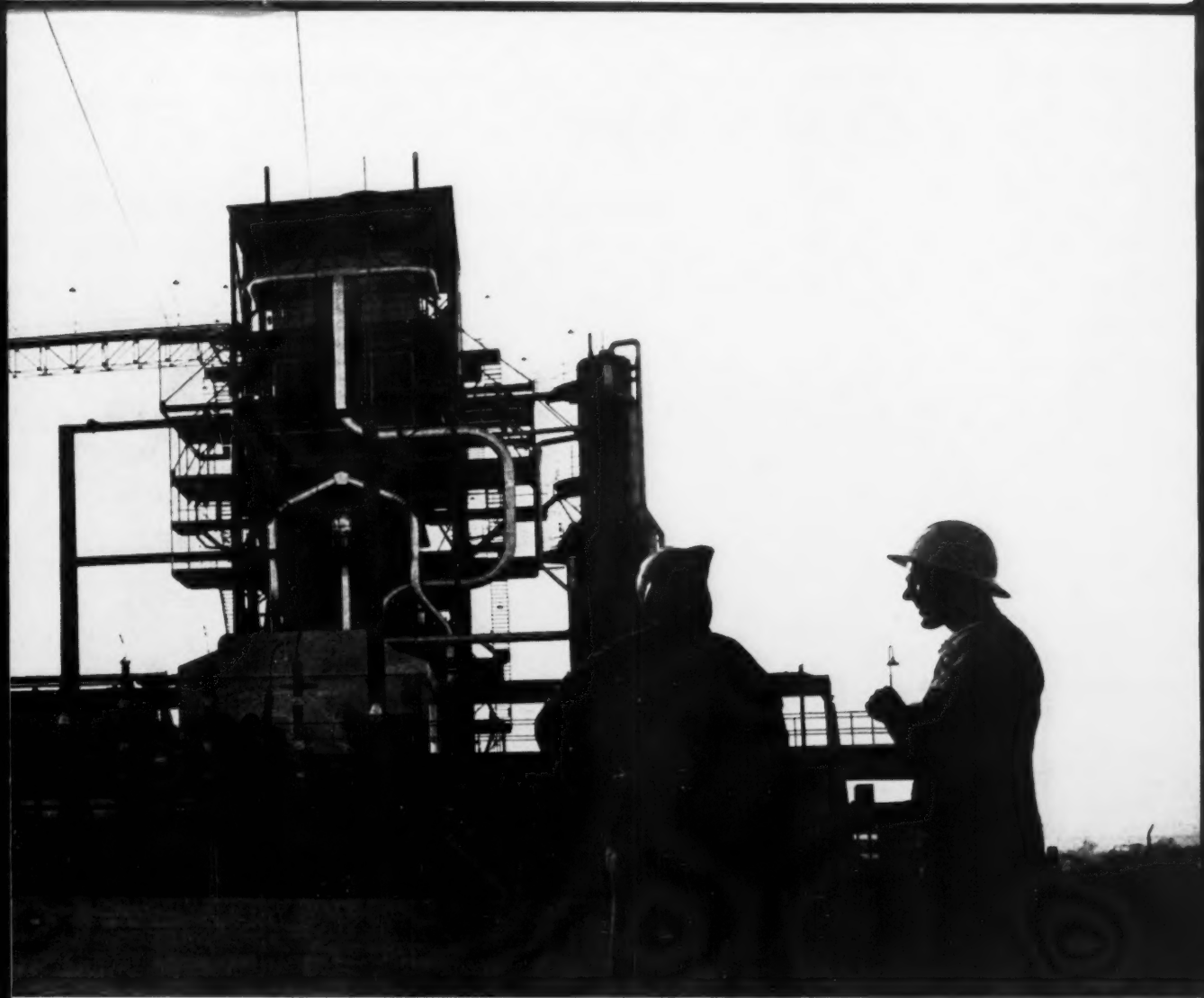


# *New Plant at San Bernardino*

The two-unit, 132-m.w. steam plant recently completed at San Bernardino for California Electric Power Company has a number of unusual features.

There are only two operating levels—grade and firing aisle. A broad ramp permits access to the firing aisle by large trucks, and on both levels clearances are ample so that equipment can be serviced by fork-lifts. All rotating equipment, except turbo-generators, is mounted at ground level, minimizing vibration and simplifying maintenance.

All feedwater heaters, together with many pumps and other auxiliary items, are located in a bay between the two turbo-generators, where they are easily accessible to the gantry crane and to fork-lift maintenance trucks.



The plant burns natural gas or heavy residual fuel oil. A unique oil pumping system eliminates the need for heated lines from storage to day tank.

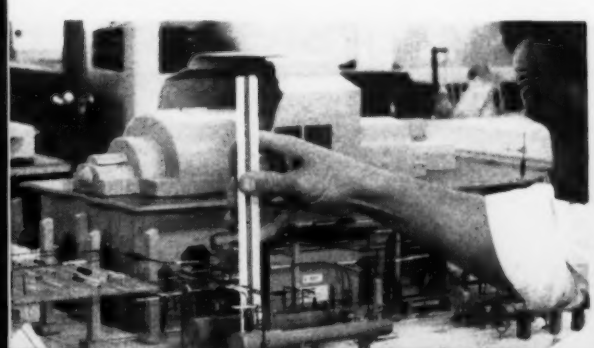
All principal water tanks are combined into two 82-foot "pisa towers" which support the deaerators, and all sweet-water condensates drain into two collecting wells sunk 42 feet below ground level.

The plant is operated by three men per shift. Both units were completed ahead of schedule and below the cost estimate, and both were placed in commercial operation within two weeks after first roll-over.

Structural layout and all important details were worked out on a scale model before any drafting was done. Calectric engineers were able to watch their plant grow in three dimensions, approving each detail as it was added to the model.

The plant was built by Fluor under a total-responsibility contract covering economic study, design, engineering and construction. This arrangement enabled Calectric to exercise complete day-to-day control over the entire course of the project, in close liaison with Fluor project management.

The Fluor brochure, "Calectric's San Bernardino Steam Plant," describes this unusual station in detail. Write to Department #22, The Fluor Corporation, Ltd., 2500 South Atlantic Boulevard, Los Angeles 22, California.



*When you consider expansion...*

*the most important investment you can make*

*is in the creative ability of men*

**FLUOR**

*Engineers & Constructors*

LABORATORY CONTROLLED...

Crapo

GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

**Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.**

*Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."*

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana

# BULLETINS ETC.

(21) **RURAL LIGHTING** — Bulletin GEA 6703A outlines benefits of better lighting in rural or suburban areas with automatically controlled mercury-vapor lighting. A twist-lock photoelectric control is featured. Write to General Electric Co., Schenectady 5, N. Y.

(22) **METAL-ENCLOSED BUS** — A new bulletin designed to aid in the selection of metal-enclosed bus for utility and industrial use has been published by I-T-E Circuit Breaker Co., 1900 Hamilton St., Philadelphia 30, Pa. Ask for bulletin 2604-1A.

(23) **FIXTURE CATALOG** — The 1959 catalog of the Moe Light Division of Thomas Industries Inc., 410 S. Third St., Louisville 2, Ky., is now available.

(24) **OIL CIRCUIT RECLOSER** — Bulletin CR1B, describing the Kyle type E oil circuit recloser, is now available from Line Material Industries. Write to Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.

(25) **DRY-TYPE TRANSFORMERS**—GEA-6668A describes General Electric's all-new, low-sound open dry-type transformers for industrial and commercial applications. Units are rated 300 kva and above, 601 to 15,000 v, and feature inorganic insulation to add to transformer life. Aluminum conductors give lightness, and construction features give lower sound levels. Write to the company at Schenectady 5, N. Y.

(26) **CONDUIT SPACERS** — A data sheet dealing with plastic conduit spacers, offered by Underground Products Inc., 12801 Inkster Rd., Livonia, Mich., is now available. Molded in one-way units, each has an interlocking device consisting of two lugs on one side and mating holes on the other. Various sizes and separations are available.

(27) **ELECTRIC HEATING** — Catalog F-1005 offered by Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa., gives application information on various types of electric heating units and their controls designed for residences.

(28) **VOLTAGE DROP MANUAL**—A useful manual of tables and graphs for determining voltage drop in aluminum and copper conductors is now available from Kaiser Aluminum & Chemical Sales Inc. For your copy, write to the company, Department NR-33, 919 N. Michigan Ave., Chicago 11, Ill.

(29) **INDUSTRIAL LIGHTING** — A new 16-page booklet on industrial lighting is available from Day-Brite Lighting Inc. Fixture cost comparisons, cost of lighting per square foot and numerous installation photos are carried. The booklet is entitled "Operation Uplight." Address is 6260 N. Broadway, St. Louis 15, Mo.

(30) **SIGNALING MANUAL** — "The Edwards Signal Log," a pocket-sized resume of signaling systems, components and their application, is available from Edwards Co. Inc., Norwalk, Conn.

**KILL TWO BIRDS WITH ONE STONE—Fill out this coupon and get back valuable information from as many sources as you indicate.**

**ELECTRICAL WEST**
**68 Post St., San Francisco 4, Calif.**

*Not good after July 1*

Please send me, without obligation, the new product information or catalogs

**If described in Product News, circle item number**

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

**If described in advertising, fill in page number**

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

*Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

# No trouble calls with PUSHMATIC

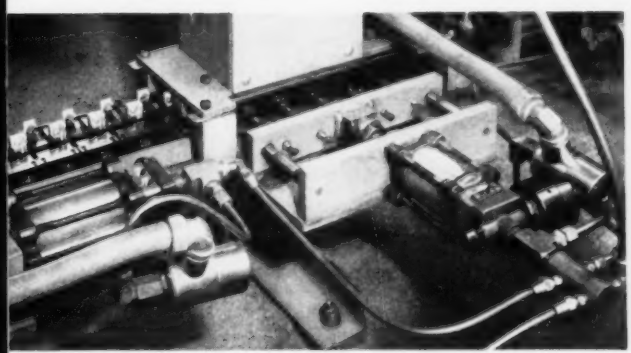
*Every breaker is individually performance tested*

Browse along our production line and it will be apparent why this circuit breaker has earned the reputation as the *safest and most dependable* on the market. Following are five of the dozen or more exhaustive checks and quality controls the Pushmatics undergo — over and beyond those required by Underwriters'.


**BULLDOG ELECTRIC PRODUCTS DIVISION**
**I-T-E CIRCUIT BREAKER COMPANY**
**BOX 177 • DETROIT 32, MICHIGAN**

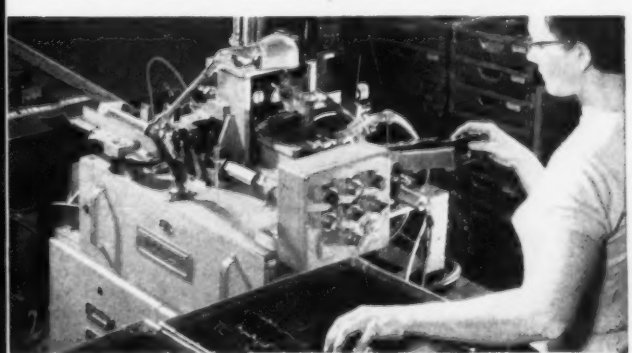
In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

**1. CALIBRATION** In a dust-free room, where temperature is maintained at a constant 75°, operators calibrate *every* Pushmatic bi-metal assembly on a special optical viewer. Each bi-metal "latch" is adjusted to a dimensional accuracy of 1/1000 of an inch. Prior to this, the bi-metal had been heat-treated in an inert atmosphere to relieve stresses, "normalize" the metal.

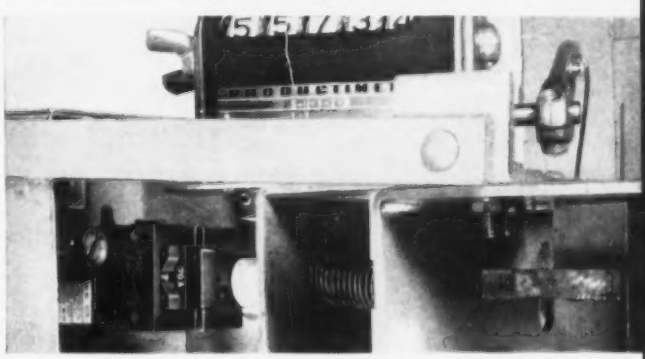


**2. MECHANICAL BREAK-IN** After assembly every Pushmatic is operated 50 times to make absolutely sure it functions well mechanically. Ten break-ins would be adequate . . . the extra 40 give you that much more assurance that it will never fail in manual or automatic operation.

**3. CALIBRATION UNDER LOAD** Brought back to its "set" temperature, each breaker is checked at 200% of rated current, and again at the equivalent of 125% of rating. Check Boards are accurate to 1/10 of a second. Samples from each production run are also tested at 100% of rating.



**4. SHORT CIRCUIT TEST** Being thermal-magnetic devices, Pushmatics then undergo severe short circuit currents to test the instantaneous trip time of the magnetic element. If a breaker fails to trip within .02 seconds, it is automatically rejected by the machine. Extra safety, extra performance.



**5. ENDURANCE TEST** Underwriters' Laboratories run periodic endurance tests on BullDog Pushmatics®. The requirement — 10,000 operations, 6000 under load and 4000 with no load. But BullDog constantly checks out the breakers at 50,000 or more operations. *End trouble calls. Use Pushmatic!*

*Consult the following Pacific Coast representatives:*

**Coast Electric & Manufacturing Co.**
1733 N. E. Seventh Ave., P. O. Box 7712
Portland 12, Oregon

**Young Electric & Mfg. Co.**
2134 Curtis St.
Denver 2, Colorado

**Safety Switchboard Company**
910-89th Avenue
Oakland 21, California

**BullDog Elec. Prod. Co. of Los Angeles**
2885 E. Washington Blvd.
Los Angeles 23, California

# NEW!

## KLEIN REPLACEABLE GAFF ADJUSTABLE CLIMBERS

**ADVANTAGES OF KLEIN REPLACEABLE GAFF ADJUSTABLE CLIMBERS**

- Leg irons drop-forged from select electric furnace steel individually heat-treated and tested.
- Replaceable gaffs 1⅝ inches long measured on underside are drop-forged from electric furnace alloy tool steel, individually heat-treated and tested.
- Special screw with locking nylon insert anchors gaff firmly in position.
- Screw does not absorb any load when climber is in use.
- Leg irons fully polished in the critical section before finishing.
- Tilted stirrup provides maximum comfort.
- Extra clearance in stirrup adds comfort by firmly supporting entire width of arch.
- Heat-treated strap attachments assure maximum wear.

These new Klein climbers have been developed to meet the demand for a replaceable gaff adjustable climber that assures maximum quality and safety. For maximum safety, we recommend the leg iron be replaced after three sets of gaffs have been used.

The easily replaceable gaff is held in position by a self-locking screw. The full impact when using the climber is absorbed by the gaff and leg iron. No load is transmitted to the self-locking screw.

Adjustable to 14½, 15, 15½, 16, 16½, 17, 17½, 18, 18½ and 19 inches. Made in matched pairs, right and left. Wide stirrup gives full support. Offset shank brings gaff in proper line with the leg bone, assuring greater security and comfort. Aluminum finish. Every climber individually tested.

**ASK YOUR SUPPLIER**

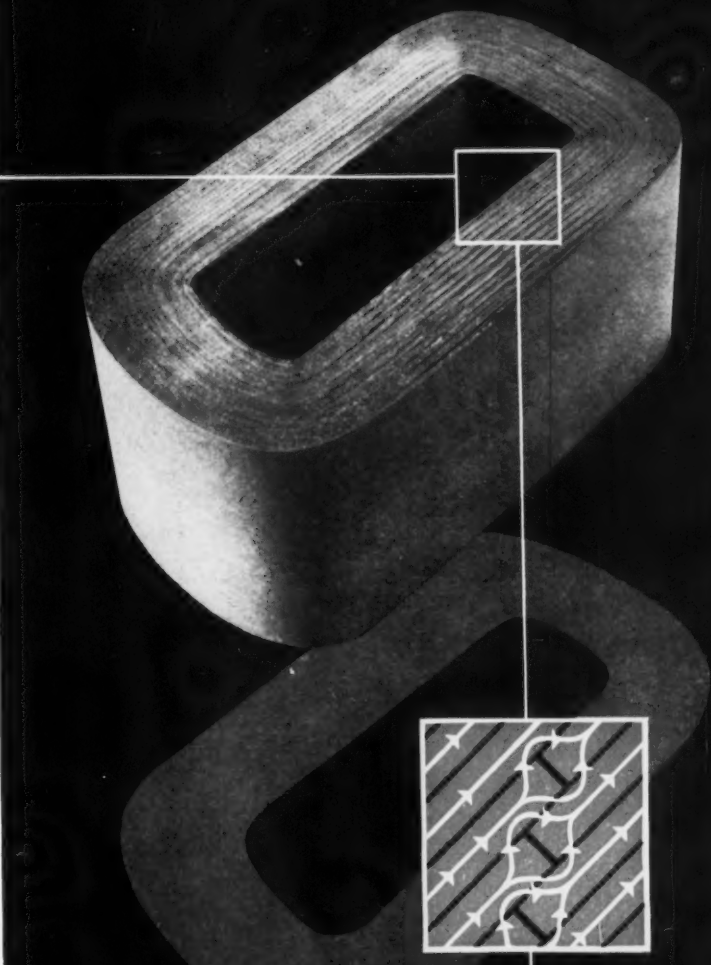
Foreign Distributor: International Standard Electric Corp., New York

Mathias KLEIN & Sons
Established 1857 Chicago, Ill., U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS

**Write for Bulletin No. 559, giving full information on Klein replaceable gaff adjustable climbers.**

*For phone number of closest representative see advertising index in back of book.*

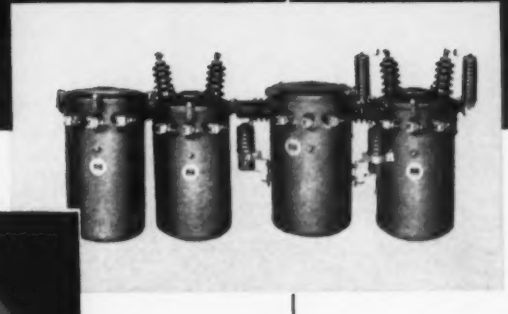
## THE MOLONEY CORE . . . DESIGNED FOR PERFORMANCE



Developed by Moloney engineers for use in distribution transformers, the MOLONEY CORE is made of single-turn, cold-rolled, grain-oriented, silicon steel laminations having the ends butted one against the other. To accomplish a high permeability path for the magnetic lines of force and reduce flux density at the gaps, the butt joints are distributed over one entire side of the core and arranged so that adjacent laminations do not have air gaps opposite each other. After the core is formed, it undergoes an annealing process to relieve any mechanical stresses introduced during manufacture.

The MOLONEY CORE is a compact core having low losses and exciting current, thereby keeping operational costs to a minimum, and is the result of research and development programs dedicated to the continued improvement of Moloney Transformers . . . Specify Moloney Transformers . . . All Along the Line.

MES# 2



**MOLONEY ELECTRIC COMPANY**

*Manufacturers of Transformers for Utilities, Industry, and Electronic Applications*

**FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA**

*For phone number of closest representative see advertising index in back of book.*

# Blackburn's

# New Testing Facilities

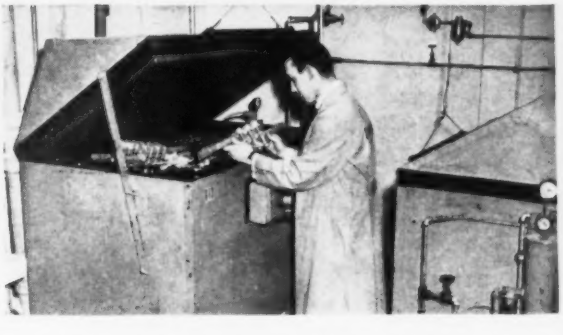
## give accurate test data for utilities, precise evaluation of design ideas

*PART OF THE CONTROL PANEL* of Blackburn's recently completed current cycling laboratory. John A. Toedtman, Chief Engineer (left), and Ken Way, Vice President, observe tests in progress.

*NEW CURRENT CYCLING LABORATORY* features virtually draftless air conditioning and a means of closely controlling ambient temperatures throughout the test area. Control of these factors permits truly precision testing of connectors. This photo shows Blackburn laboratory technicians taking resistance and temperature measurements of test connections. These new facilities permit testing of more than 500 connectors simultaneously. Advanced testing facilities like these enable Blackburn to provide you with the proper fitting for every operating condition.

***THE GENERAL LABORATORY,*** a portion of which is shown here, is the scene of a great variety of tests. Hardness, yield and breaking strength of parts such as castings, bolts, etc., are determined. Special equipment is available for pull-out or holding force evaluation of all fittings. Clamping force measurements giving the relationship between tightening torque and the force exerted by the connector on the conductor are made here. Microscopic examinations and special electrical resistance measurements are routine. Tests like these give Blackburn fittings great dependability.

***THE CHEMICAL LABORATORY*** is the center for tests to control various chemical process solutions used in production. Electroplating, etching, and metal cleaning solutions are regularly tested here. In addition, special surface treatments are evaluated for friction control and corrosion protection. Thus, this laboratory assures continuous control of quality.



***SALT FOG CHAMBER,*** where tests may continue for hundreds or even thousands of hours. Here salt fog tests are made on wire connections. Test conditions are made in accordance with ASTM specifications. Electrical resistance measurements and visual observations are recorded at regular intervals during the tests.

***OUTDOOR EXPOSURE RACKS*** permit long-term exposure tests which often yield valuable information on weathering resistance not accurately obtainable from more highly accelerated tests. Specimens on these racks generally remain on test for at least a ten-year period.

**Look to BLACKBURN for *test-engineered* electrical fittings**

**JASPER BLACKBURN CORPORATION**

1525 Woodson Rd. • St. Louis 14, Mo. • WYdown 3-9430

*For phone number of closest representative see advertising index in back of book.*

# DEPENDABLE
# FISHER-PIERCE
# EQUIPMENT
## ...for outdoor lighting control

Model 6601A
Pole or
crossarm mounting

Model 6607A
with pole top
adapter

Model 6603A
Replacement plug-in
for FP Model 64400GE

Model 6602A
Luminaire or
slipfitter mounting
(1¼" top tap)

Model 6604A
Replacement
plug-in for
FP Model
S-64400

Model 6600A ACTUAL SIZE

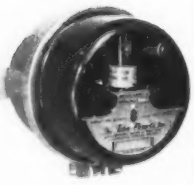
**NEW SERIES 6600A PHOTOELECTRIC CONTROLS —**
**tubeless, field-tested, low-cost.**

Rugged, reliable control fully tested in the field for five years; guaranteed for two years. Uses hermetically sealed cadmium sulfide photocell driving a specially-designed Sigma relay. Lightweight, measures only 2⅛" high x 3⅛" in diameter, easy to install. Three prong twistlock plug and removable sponge gasket conform with EEI-NEMA specifications for twistlock adaptations. Features include built-in lightning protection; delayed response to prevent accidental turn-off by lightning; fail-safe operation; and adjustable turn-on. Switches 1000 watts, operates on 105-135v, 50/60 cycle AC; standard turn-on 1.5 ± 0.5 foot-candles. Temperature range −55° to +70°C; humidity tested to 100%.

***Model 6600A*** (shown actual size) is the basic model in the series, fits bases up to 3" in diameter; ***Model 6607A*** fits wider mounting bases, up to 3⅛" in diameter. Both may be used with various Westinghouse, GE, Wheeler, Joslyn and other popular luminaires. With standard adapters and mounting hardware (see Models 6601A, 6602A, 6603A, and 6604A), 6600A Series controls meet a wide variety of mounting requirements.

**SERIES 63300C PHOTOELECTRIC CONTROL —**
**switching capacity up to 6000 watts; turn-on 1 to 1000 foot-candles.**

Electronic head enclosure is waterproof; plugs directly into meter socket... standard switching arrangements SPST, SPDT, DPST... fail safe operation... delayed circuit response to prevent false operation due to lightning... fuse and potentiometer checked or adjusted without removing enclosure... for 105-130 or 210-250 volt, 50/60 cycle operation; insulation level 4.5 KV.



**FISHER FP PIERCE**
**PHOTOELECTRIC LIGHTING CONTROLS**
AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

For descriptive bulletins on any of this equipment write to The Fisher-Pierce Co., 43 Pearl St., So. Braintree 85, Mass.

**SERIES 6100 CALIBRATOR**

... for checking and adjusting turn-on and turn-off points of nearly all types of photoelectric lighting controls. Easy to use... accurate... portable. Assures uniform turn-on settings, better control of burning hour schedules, thorough testing of units before installation; useful for trouble-shooting. Operates on 117 volts, 50/60 cycles AC; special adapter available for 220 volt operation.

**TYPE 250A MULTIPLE RELAY**

... for pilot wire control, cascading street lighting circuits, or industrial applications. Weatherproof, dependable, low-cost. Normally-open or normally-closed contacts; 30-ampere rating with maximum inrush of 300 amperes; 3000 watt lamp load; 105-130 volt, 50/60 cycle operation. Equipped with built-in expulsion-type lightning arrestor.

*Republic* ELECTRUNITE *E.M.T. was originally installed in concrete during construction of the United States Customs and Court House, St. Louis, Missouri, twenty-five years ago.*

*It was necessary to make cuts like this for duct work in the air conditioning and remodeling program. Notice the new-like appearance of the* ELECTRUNITE *E.M.T.*

# THE BEST COSTS LESS INSTALLED

## ...in service Twenty-Five years in concrete

# Republic ELECTRUNITE E.M.T.

## ready for greater load-building today...tomorrow

Republic ELECTRUNITE® E.M.T., 275,000 feet of it, was originally installed during construction of the United States Customs and Court House, St. Louis, Missouri, twenty-five years ago.

Recently, in remodeling for air conditioning, it was necessary to cut through concrete floor, exposing the ELECTRUNITE installed so many years ago. Additional load-building was included in the remodeling program.

Because ELECTRUNITE was originally installed, the remodeling job was easier and faster. Connections were tight. No evidence of corrosion. No delays held up the air conditioning contractor. Additional load-building equipment was added with no trouble.

Here again, time proved . . . *the best costs less installed.* To learn more about the advantages of Republic's ELECTRUNITE E.M.T., call your electrical distributor. Or use coupon below and write direct.

**REPUBLIC STEEL**
**STEEL AND TUBES DIVISION**

REPUBLIC STEEL

**Cleveland 8, Ohio**

**REPUBLIC STEEL CORPORATION**
**STEEL AND TUBES DIVISION**
**DEPT. C-7844**
**216 EAST 131st STREET, CLEVELAND 8, OHIO**

I would like to learn more about the features and installation advantages of Republic ELECTRUNITE E.M.T.

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

*For phone number of closest representative see advertising index in back of book.*

# Are the appliances you want most in the new home you plan to buy?

Every MEDALLION HOME has an all-electric kitchen with electric range and oven—and more from this list of additional appliances:

Electric DRYER
Electric WASHER
Electric DISHWASHER
Electric REFRIGERATOR
Electric WATER HEATER
Electric GARBAGE DISPOSER

*The Medallion award* on a new home guarantees you major electrical appliances, already installed. And you get ample wiring ... full Housepower for future needs ... *plus* lighting which is both functional and beautiful.

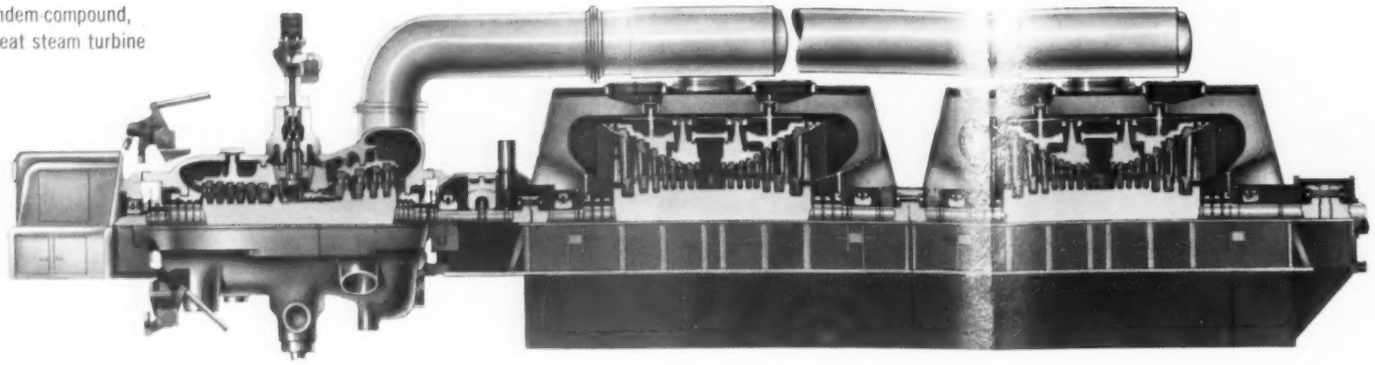
*So look for the Medallion*—national symbol of better housing and modern electric living. It identifies today's best new-home buys in every style, size, location and price range. No family should buy a home without the Medallion Home award.

SOUTHERN CALIFORNIA Edison COMPANY *helps you* LIVE BETTER—ELECTRICALLY

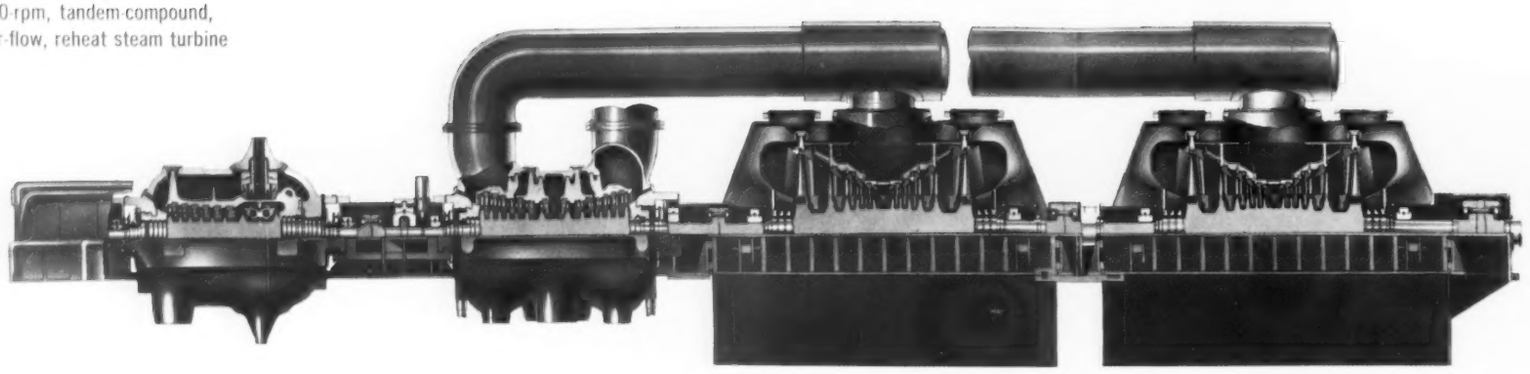
Go to the all-electric kitchen carnival ... at your appliance dealer's now

*For phone number of closest representative see advertising index in back of book.*

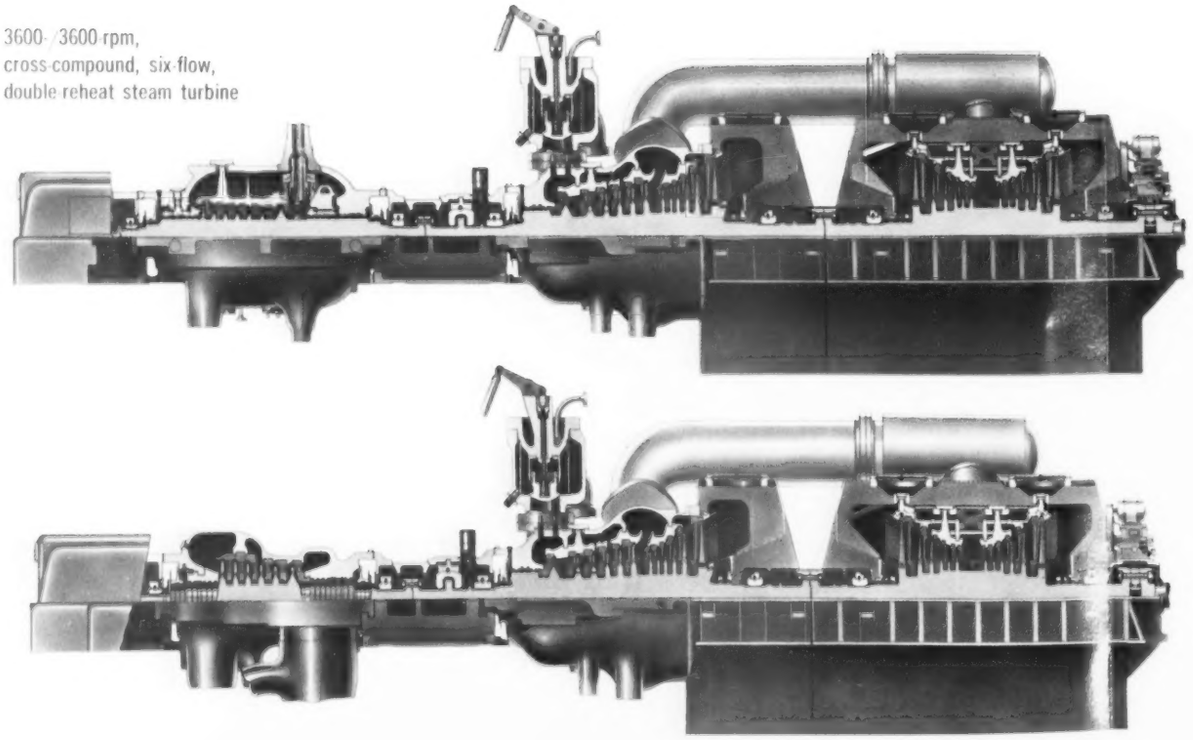
3600-rpm, tandem-compound,
four-flow, reheat steam turbine



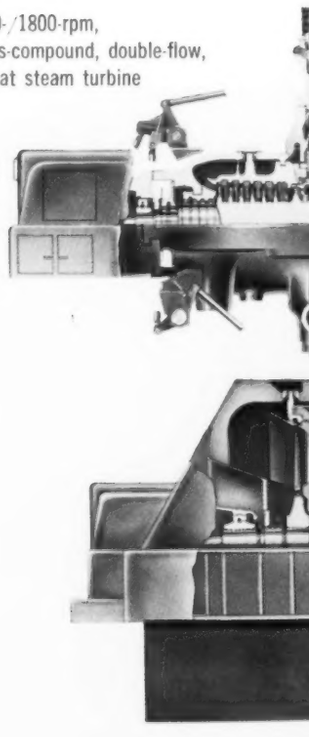
3600-rpm, tandem-compound,
four-flow, reheat steam turbine



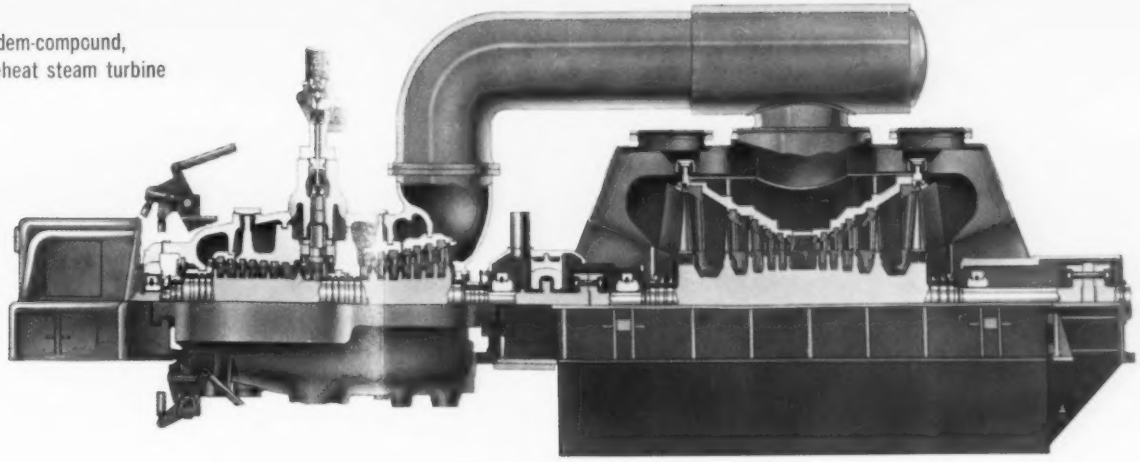
3600-/3600-rpm,
cross-compound, six-flow,
double-reheat steam turbine



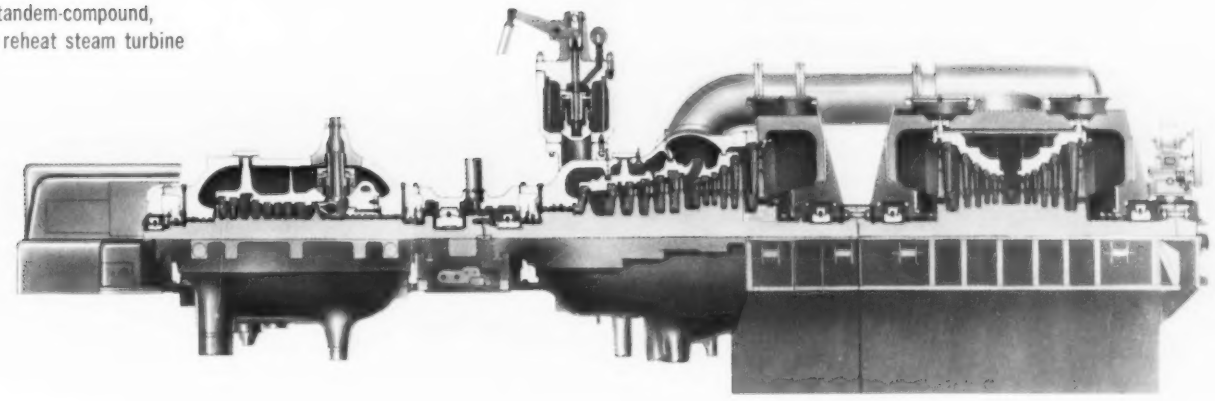
3600-/1800-rpm,
cross-compound, double-flow,
reheat steam turbine

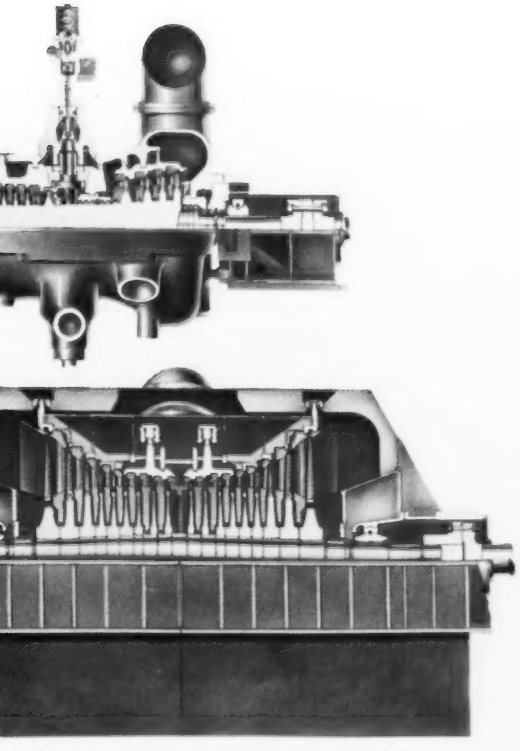


3600-rpm, tandem-compound,
double-flow, reheat steam turbine

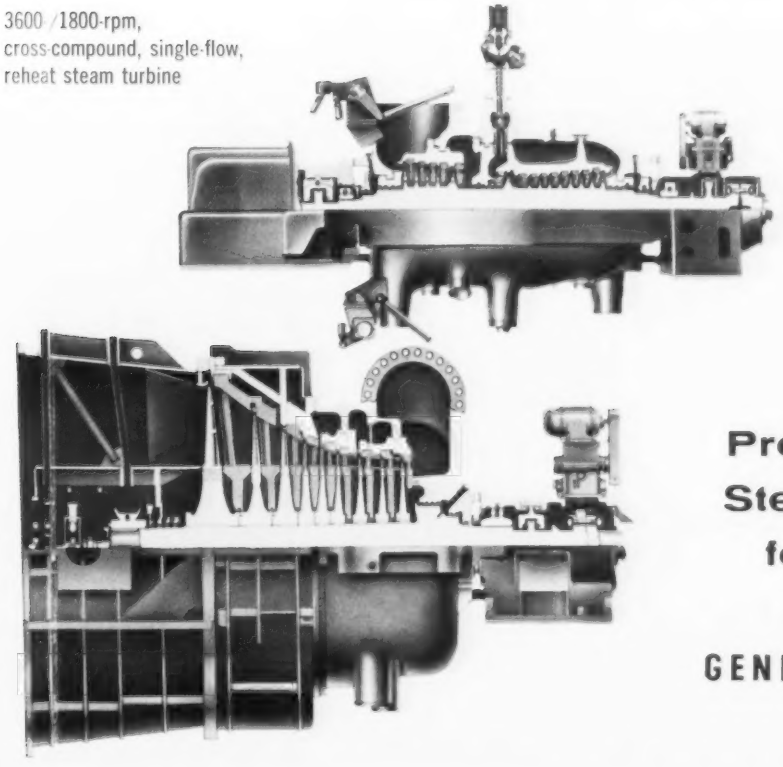


3600-rpm, tandem-compound,
triple-flow, reheat steam turbine





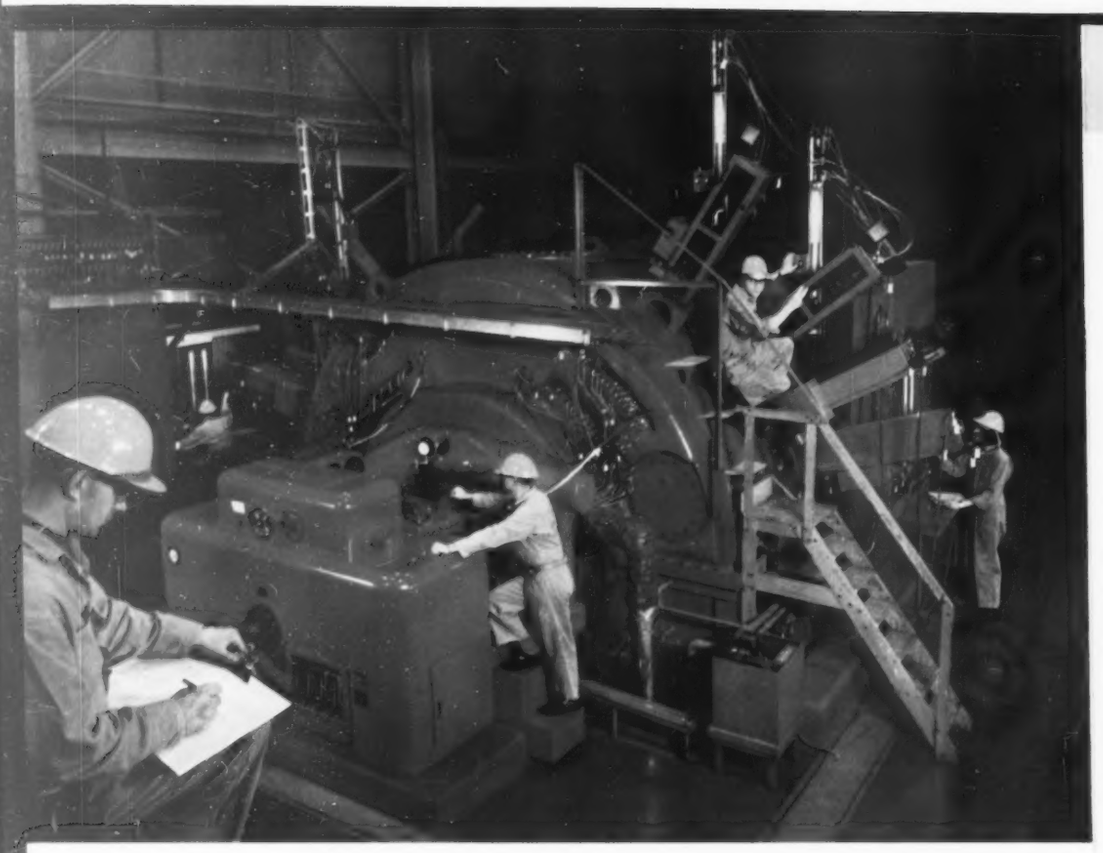
3600/1800-rpm,
cross-compound, single-flow,
reheat steam turbine



**Pre-engineered Steam Turbines for the '60's**

100,000 to 600,000 kw

GENERAL ELECTRIC





# Designed No
# Turbines for the

As another step in its continuing progress to help electric utilities keep electric power America's greatest bargain, General Electric is introducing seven advanced-design, pre-engineered steam turbines specifically designed to meet electric generation requirements in the '60's.

The engineering features incorporated in these units—for top reliability, high performance and maximum simplicity—are the result of over 50 years of intensive research and development coupled with bold planning, engineering enterprise and close cooperation with electric utility companies and consulting engineers.

GENERAL ELECTRIC

## Why General Electric Offers More For Your Steam Turbine-Generator Dollar Investment

### Performance

General Electric's progress in attaining higher operating pressures and temperatures and increased component efficiencies is helping to assure further improvement in the coal rate of electric utilities. With the ever-increasing demand for improved performance, a continuous and diversified program of product development is being carried on in the company's research and development laboratories.

### Reliability

General Electric's intensive basic research and development, sound engineering design, modern manufacturing techniques and proper operating practices contribute to the reliability of large steam turbine-generators.

Work performed at the Large Steam Turbine-Generator Department's Materials and Processes Laboratory and the Product Development Laboratory spearheads these efforts.

### Service

Completely integrated service—from initial order throughout the unit's operating life—is part of the "added value" purchased with each General Electric steam turbine-generator.

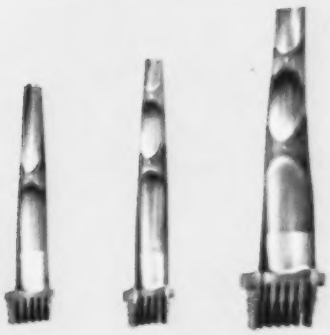
Two-way communication of service information through the turbine-generator Product Service organization enables factory know-how to supplement the efforts of field service representatives, and permits factory specialists to take full advantage of field operating experience.

Improved performance, greater reliability and completely integrated service mean more economical generation of electricity.

GENERAL ELECTRIC

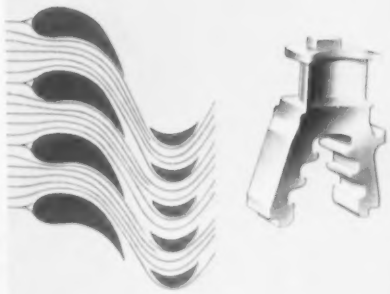
# Now – the '60's

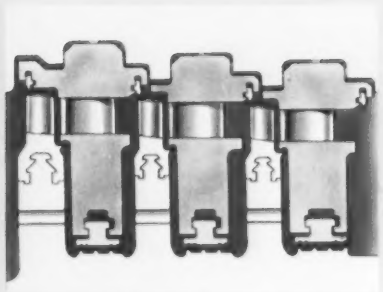
## Important Evaluation Features Of General Electric Pre-Engineered Steam Turbines . . .



**Progressive Bucket Design**

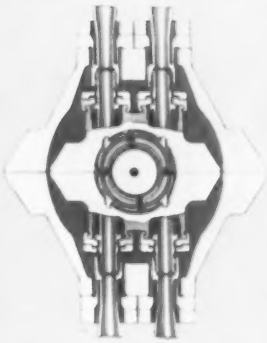
**Impulse-Type, Solid Rotor Construction**





**Removable Radial Spill Strips and Spring-Backed Shaft Packing**

**Nozzle Box Construction**



## . . . What They Mean To You

- Minimized Investment
- Improved Performance
- Simplified Operation
- Increased Availability
- Greater Reliability
- Accelerated Installation
- Reduced Maintenance
- Extended Life

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

# "Heat pumps give us the perfect business climate"

Listen to Nick Dalis, co-owner of the Hofbrau, San Jose's popular Bavarian restaurant: "Our new heat pumps really keep the air fresh and clean. And the temperature never varies more than 4°, winter or summer . . . whether we have 50 or 250 diners."

It's all done automatically! Once you select a climate range (say 70-74°), the heat pump begins heating when the temperature falls below 70°. Above 74°, it reverses and cools the air. Dirt, pollens and excessive moisture are removed from the atmosphere. Heat pumps need no flues; leave no ash, soot or smoke! Electricity runs them.

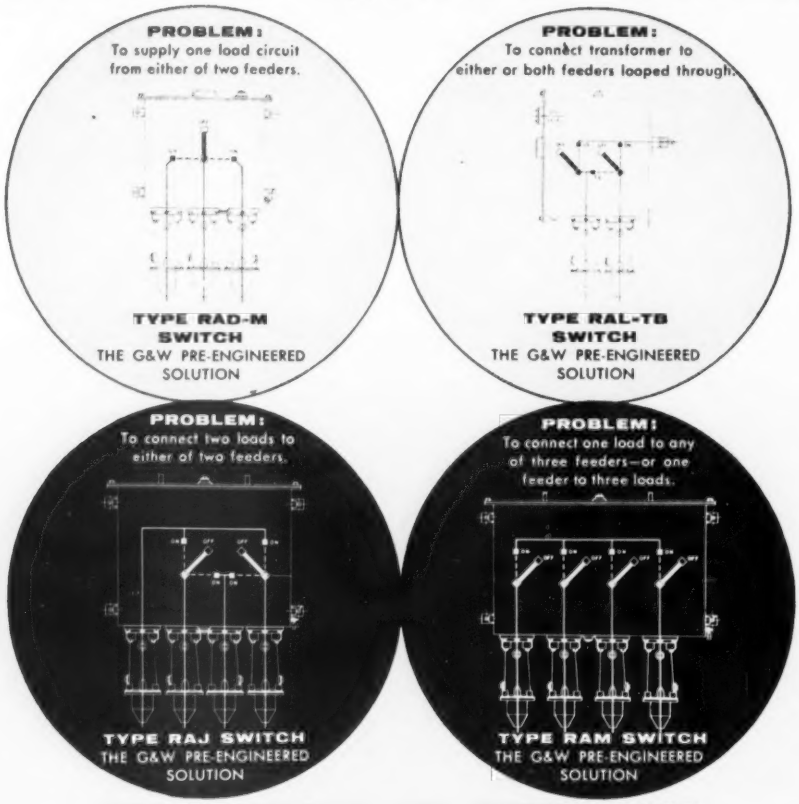
A multiple heat pump installation (twelve 3-ton units) gives the Hofbrau Restaurant a flexible multi-zone system. This means one area can be cooled, while another is being heated . . . all automatically, depending on each zone's need.

Your place of business will benefit from this kind of climate control. Customer comfort (and employee comfort) pays off! For more information on heat pumps, write us at 245 Market, San Francisco. Room 410.

*Electricity is cheap in California* **P·G and E·**

*Pacific Gas and Electric Company*

## examples of G&W
# distribution system flexibility


PROBLEM:
To supply one load circuit from either of two feeders.
TYPE RAD-M SWITCH
THE G&W PRE-ENGINEERED SOLUTION
PROBLEM:
To connect transformer to either or both feeders looped through.
TYPE RAL-TB SWITCH
THE G&W PRE-ENGINEERED SOLUTION
PROBLEM:
To connect two loads to either of two feeders.
TYPE RAJ SWITCH
THE G&W PRE-ENGINEERED SOLUTION
PROBLEM:
To connect one load to any of three feeders—or one feeder to three loads.
TYPE RAM SWITCH
THE G&W PRE-ENGINEERED SOLUTION

**PRE-ENGINEERED FOR MINIMUM COST**

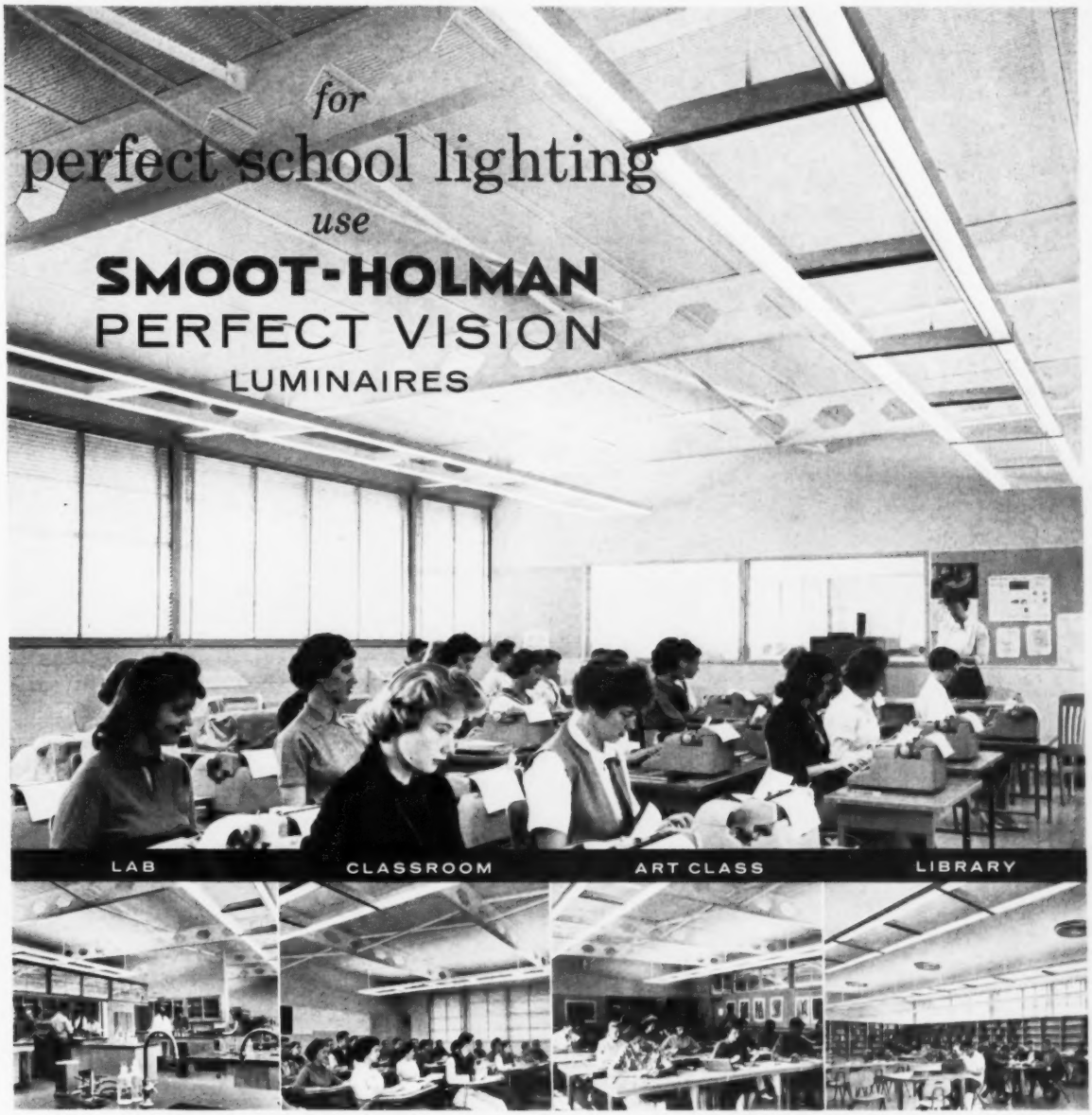
Pick a distribution system problem—and you'll find a basic G&W Load Break Oil Switch that's *pre-engineered* to solve it. G&W switches are made of standardized parts designed so they can be combined in a vast number of forms to handle specific by-passing, disconnecting, or fusing requirements. They allow you to meet the needs of individual load centers without the expense of individual engineering. Here is something new in distribution system flexibility—at lower cost that helps you keep construction and installation expenses down. Don't overlook the opportunities G&W pre-engineered load break oil switches offer for simple solutions to sectionalization problems at significant savings. Switches and combination units are available rated from 600 to 34,500 volts, 400 to 1000 amperes continuous capacity, 400 amperes load-break. Special switches to 69,000 volts can be furnished.

**SEND TODAY FOR OUR NEW SWITCH FOLDER**
Contains the "inside story" on safe, flexible, low-cost distribution system sectionalization.

G&W

**G&W ELECTRIC SPECIALTY COMPANY**
3506 West 127th Street, Blue Island, Illinois
*Representatives in principal cities. Canadian Mfr. —Powerlite Devices, Ltd., Toronto*

*For phone number of closest representative see advertising index in back of book.*




*Architects:* Marsten & Weston • *Consulting Engineers:* Ralph E. Phillips, Inc. • *Electrical Contractors:* McGee Electric Co.

The above photos were taken at Ganesha High School, Pomona, California, and illustrate the excellent lighting furnished by Smoot-Holman fixtures. Winston Nelson, principal of Ganesha High School states, "The fixtures provide ample foot candle illumination spread evenly over each room. We have noticed an absence of flicker and ballast noise, and we are pleased with the easy maintenance of these fixtures." B. J. Triggs, of Ralph E. Phillips, states, "It has long been recognized that indirect lighting is ideal for close work because of its lack of glare reflections and shadows. However, to obtain higher intensities we have used direct lighting. It was not until the advent of Smoot-Holman P-V series that we found it advantageous to use indirect lighting again. In this school we proved that in a typical classroom (28' x 45') using the 800 m. a. lamps in two rows of P-V fixtures we obtained practically the same illumination intensities as by using conventional 48" rapid start lamps in three rows of direct fixtures. Using only two-thirds of the lineal feet of fixtures and only two-thirds of the lighting outlets and light switches, we actually accomplished a considerable savings to the school board and gave them a better installation."

Send for free, informative brochure, "What You Should Know About School Lighting."

*Scientifically designed lighting by* **SMOOT-HOLMAN CO.**
*321 N. Eucalyptus Ave., Inglewood, Calif.*

TOMORROW'S LIGHTING TODAY

*For phone number of closest representative see advertising index in back of book.*

# WHY SPLICE AND TAPE. .

- **Needs no tape**
- **True 2-hand installation**
- **Color coded, clearly printed**

# INS

***pre-insulated service entrance***

### QUICK

Forget about taping when you connect service drop to service entrance with INSULINK, pre-insulated compression connector for copper and aluminum. Connectors are color coded for quick identification of conductor size range.

### EASY

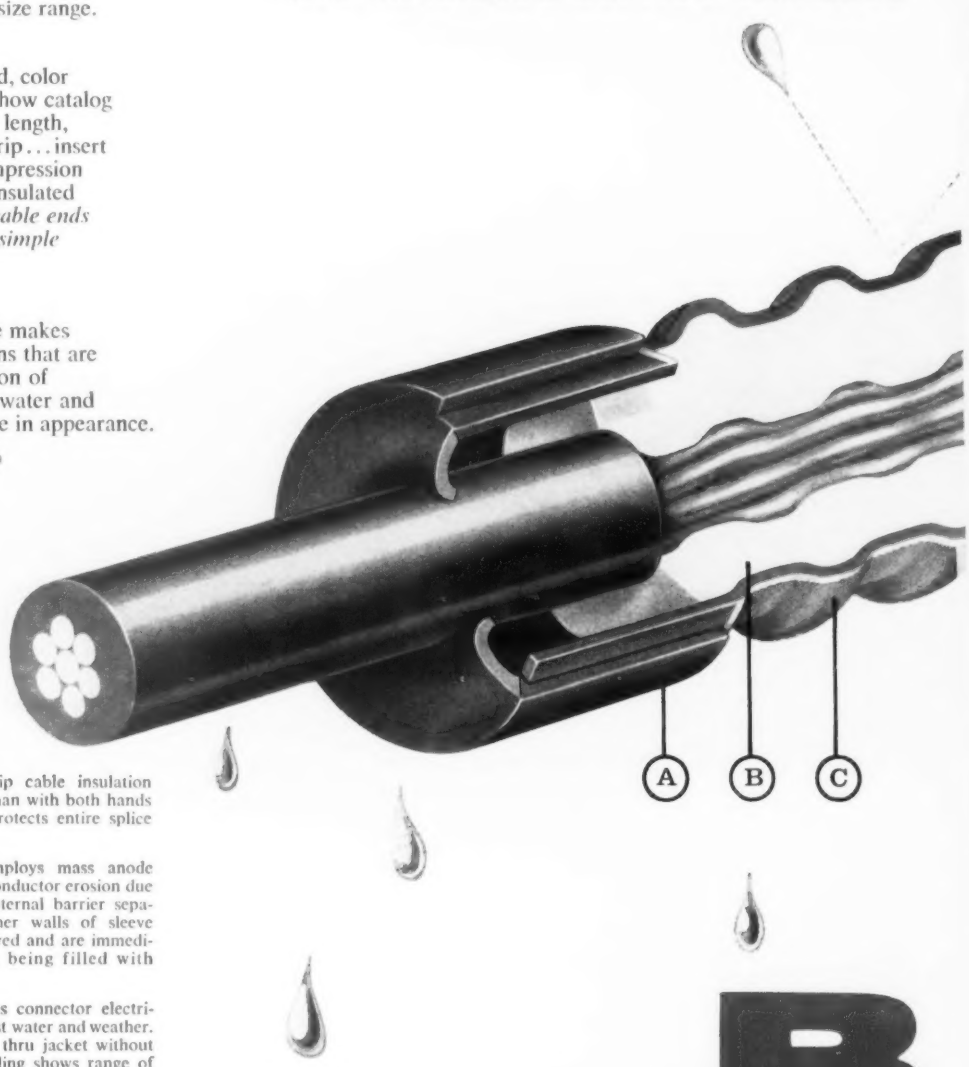
Clearly printed, easy to read, color coded jacket is marked to show catalog number, cable ranges, strip length, and where to crimp. Just strip... insert ...crimp with the same compression tool and grooves as for uninsulated splices. *The caps grip the cable ends and hold them in place for simple two-hand installation.*

### SAFE

This quick, easy procedure makes service entrance connections that are fully insulated for protection of personnel, protected from water and weather, neat and attractive in appearance.

### WIDE RANGE OF COMBINATIONS

#10 str–1/0 str copper
or aluminum
#6–#2 ACSR




(A) **Polyethylene caps** grip cable insulation securely, leaving lineman with both hands free for crimping...protects entire splice against moisture.

(B) **Aluminum sleeve** employs mass anode principle, eliminates conductor erosion due to galvanic action; internal barrier separates conductors. Inner walls of sleeve have oxide film removed and are immediately coated before being filled with PENETROX.

(C) **Nylon jacket** insulates connector electrically, protects it against water and weather. Standard tools crimp thru jacket without piercing it. Color coding shows range of cable sizes each INSULINK accommodates; arrow shows cable strip length; lines show where to crimp.

*FOR FURTHER INFORMATION AND SAMPLE, WRITE:*

**B**

*For phone number of closest representative see advertising index in back of book.*

. *just connect with*

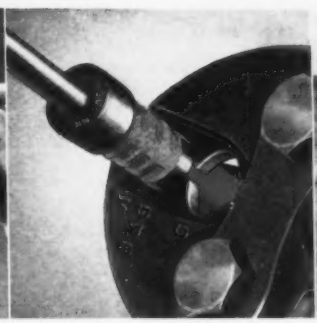
# INSULINK®

Patd. Other pats. pending

***connector for time-saving 2-hand installation***

**Strip** back phase-wire insulation . . . arrows on INSULINK show how far.

**Insert** wire ends until they meet internal barrier; **caps grip and hold cable,** both hands are free for crimping.



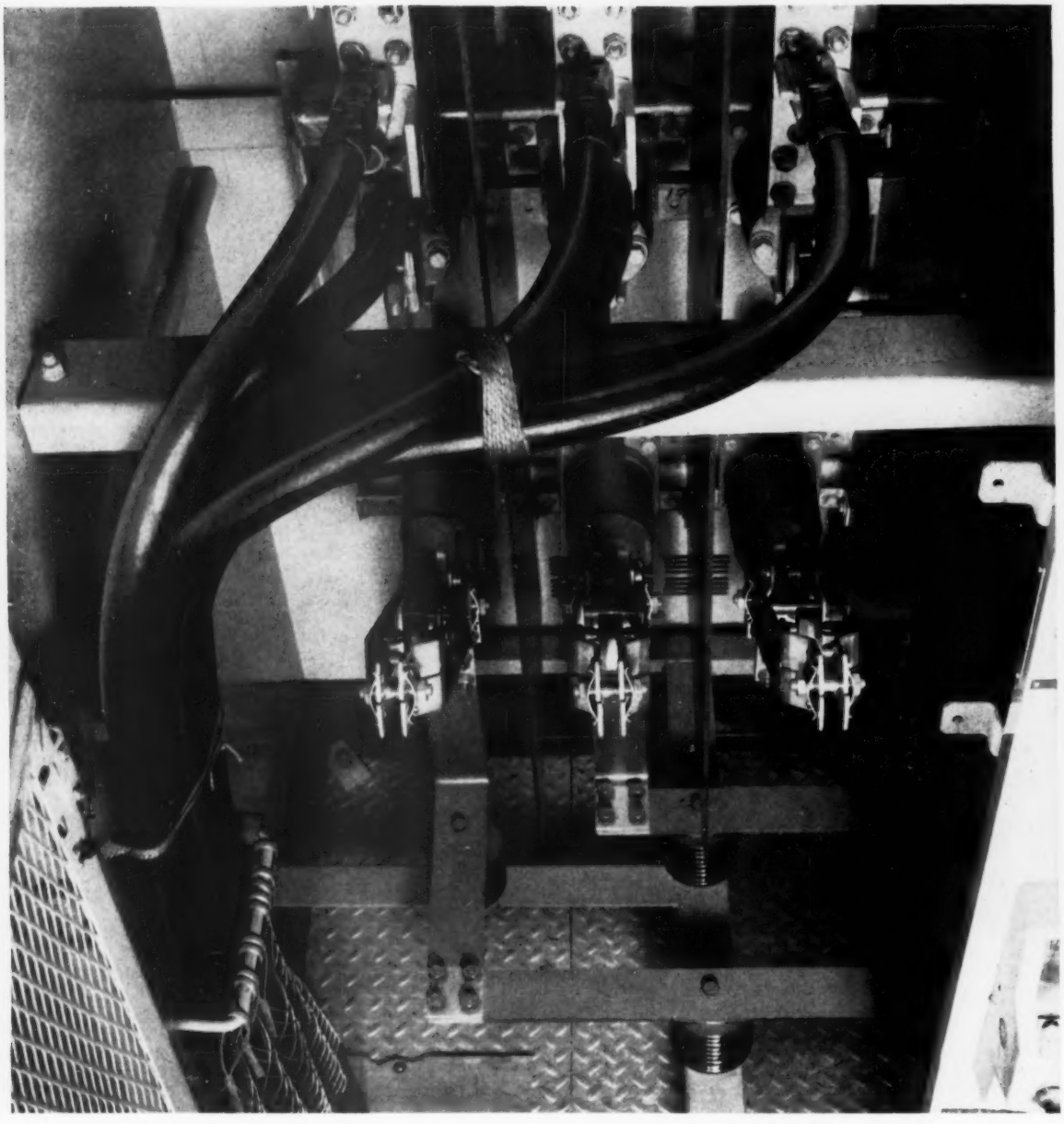
**Crimp** with standard compression tool . . . guide lines on INSULINK show where.

**Installed** INSULINK fully protects against accidental contact. Weather resistant . . . neat and attractive.

# URNDY

58-32

Norwalk, Connect. In Europe: Antwerp, Belgium Toronto, Canada



# FOR EFFICIENCY AND LONG LIFE *Specify Kerite Cable*

This 5KV unshielded cable used for power auxiliary service in an important new central station is typical of Kerite engineering to provide reliable installations in restricted space at minimum cost.

Plant engineers can "have their cake and eat it too." Hundreds of these Kerite non-shielded installations have been operating over the last 18 years without troubles or interruptions.

The reputation of Kerite insulation for long-lived resistance to the elements should make it the first choice of the power plant engineers.

**KERITE CABLE**

*it's the* KERITE *that makes the difference*

*Our headquarters is at 30 Church St., New York 7.*

**BRANCHES IN**
Ardmore, Pa., Boston, Cleveland, Chicago, Houston, San Francisco, Glendale, Cal.

*For phone number of closest representative see advertising index in back of book.*

Underground distribution system savings begin the day you decide to install J-M Transite Ducts. You can figure on lower operating costs, prolonged insulation life, more reliable service and longer cable life.

# J-M Transite Ducts permanently resist fire and arc... provide lifelong dependability, many operating economies

GONE ARE MANY of the headaches of transmitting heavy electrical loads underground, when you protect cables with Johns-Manville Transite® Ducts. They assure you of greatest protective value, and maximum load capacity, per dollar invested.

And when cable fire or failure occurs, noncombustible Transite Ducts remain undamaged and can be used again for the new lines. Regardless of conditions, Transite Ducts provide permanent service as they do not deteriorate from heat, water or corrosive soils.

Tests have shown that Transite-protected cables run cooler under given loads . . . carry greater loads at given temperatures because Transite helps dissipate heat faster. And for lower operating costs, consider the long-range value of Transite Ducts in terms of (1) increased insulation life, (2) fewer cable failures, and (3) lower $I^2R$ losses for the full working life of a system.

For details on Transite Ducts' many advantages, distribution engineers are invited to write for informative brochure EL-29A. Johns-Manville, Box 14, New York 16, N.Y. In Canada, 565 Lakeshore Road East, Port Credit, Ont.

**JOHNS-MANVILLE** JM

*For phone number of closest representative see advertising index in back of book.*

PUT FULL HOUSEPOWER TO WORK

# Fast Recovery For Faster Selling, Greater Loads

Water heaters, with an average annual load factor of 47% and an average annual usage of 3600 KWHR, build loads and profits better than any other household appliance. And, to help you add more of this important business to your lines, Hotpoint offers 40-gallon round and table-top models with the fast recovery today's consumer demands. They provide 470 gallons of hot water every 24 hours—more than 6 times the average family's daily requirements. And, they save space and money by eliminating large storage tanks. Display and promote Hotpoint fast-recovery water heaters for greater earnings.

Model WBA42-1

**15-YEAR WRITTEN PROTECTION PLAN ON DELUXE MODELS**

One-year warranty on the complete heater, and an additional 7-year replacement warranty on the tank, plus an additional 7-year tank exchange plan. 10-year written protection plan on "Silver Line" Models.

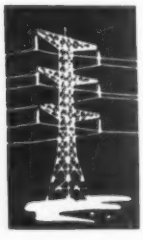
## Additional Hotpoint features your customers will want:

LIVE BETTER ELECTRICALLY

**MIRACLE MLC-7 ADDITIVE** fights rust and corrosion, can lengthen tank life as much as 200%, depending on condition of water.

**GENUINE CALROD® MAGIC CIRCLE® HEAT**—the most widely used heating units in the world. Famous for efficiency and long life.

**PROVEN LEADERSHIP**—over ⅓ of all electric water heaters have been made by Hotpoint, and less than 1% have ever needed service.

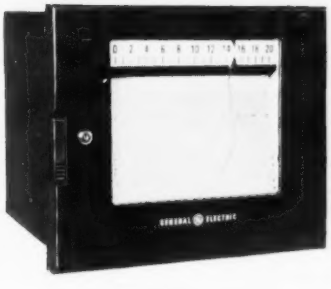


LOOK FOR THAT **Hotpoint** DIFFERENCE

*A Division of General Electric Company, Chicago 44, Illinois*

*For phone number of closest representative see advertising index in back of book.*

# *standardizes itself continuously . . .*



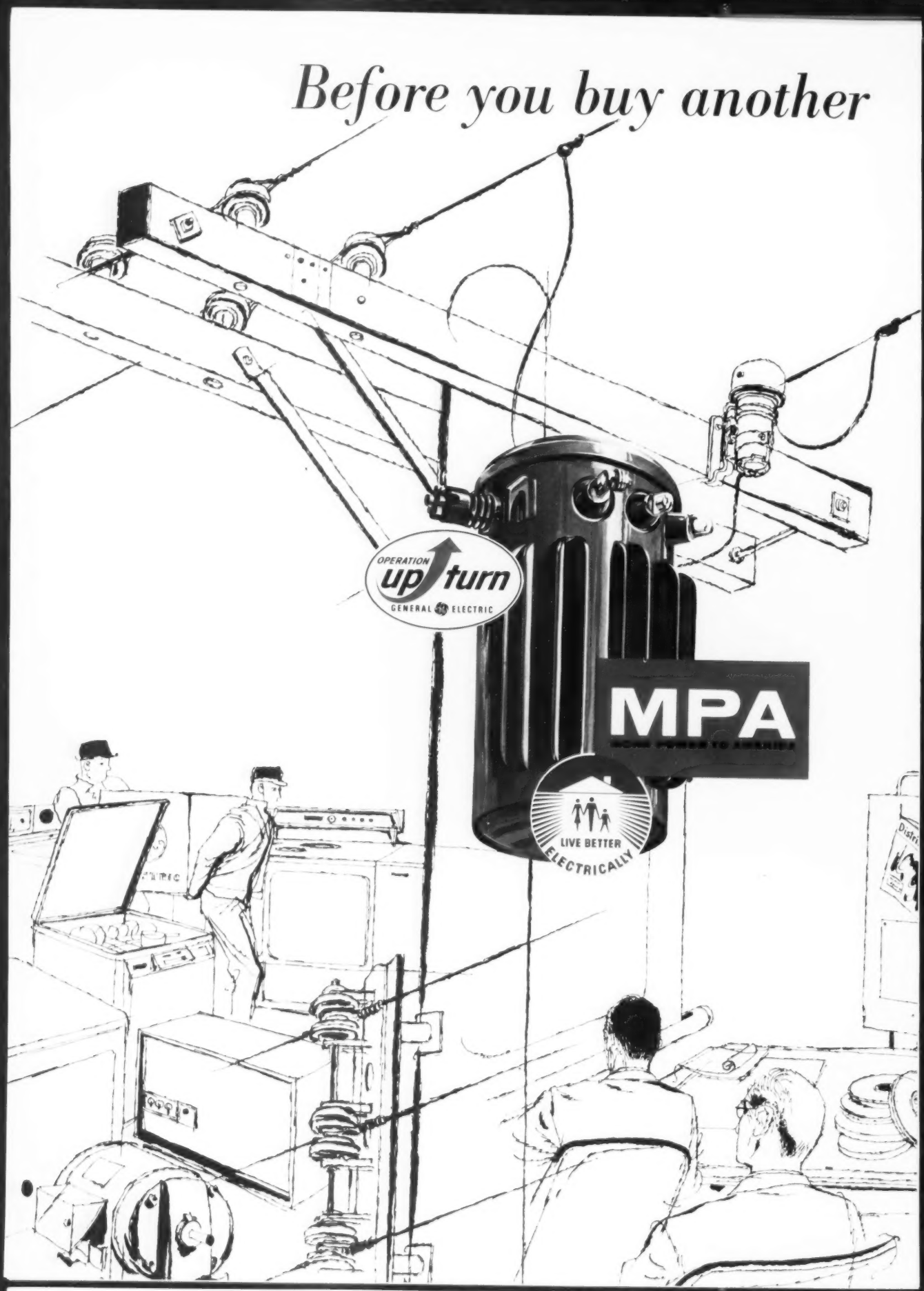
***This new General Electric Type HF recorder*** is continuously self-standardized. And it's typical of the new G-E null-balance strip-chart line. No more batteries, standard cells and standardizing mechanisms . . . new silicon diode voltage source now makes possible completely uninterrupted measurement and control—with measurement accuracy of ± ¼ percent. ***Unitized plug-in construction*** provides simple design with isolation of components by function. All major components are mounted on swing-out mechanism panel for easy servicing outside case. Both single-pen Type HF and two-pen Type HL are available. Or, for an intermittent record of up to 20 different signals, G.E.'s new Type HG multi-point recorder prints as fast as 1.2 seconds per point. All types measure ***wide range of parameters . . .*** pen speeds from 1 to 24 seconds, chart speeds from 1″/hr to 360″/hr, plus many other optional accessories and a variety of control forms. Get the complete story about these and many other outstanding features. Just call your nearby G-E Apparatus Sales Engineer, or write for bulletin GEA-6887, Section 595-102, General Electric Company, Schenectady, N. Y.

***Other Instrument Department Recorders for Electric Utilities***—*Inking and inkless; portable and switchboard; duplex and twin; hook-on recording volt-ammeters. Photoelectrics, oscillographs and vibrometers.*

*Progress Is Our Most Important Product*

**GENERAL ELECTRIC**

*For phone number of closest representative see advertising index in back of book.*


Before you buy another
OPERATION up turn
GENERAL ELECTRIC
MPA
LIVE BETTER ELECTRICALLY

# *transformer...* MEASURE LOAD BUILDING

## General Electric programs and products put load on your line

**For every distribution transformer** you purchase from General Electric, almost a dollar is invested in More Power to America, Live Better Electrically, Operation Upturn, and in other industry-wide load-building and adequate-wiring programs.

General Electric sells two dollars' worth of equipment to *consume* electric power for every dollar's worth sold to *produce* electric power. And you get the load built by these power-consuming products, ranging from home appliances to giant furnaces for industry. So General Electric products as well as programs build load.

**Before you buy another distribution transformer,** measure load-building activity—give your transformer manufacturer credit for the extra values he gives you. General Electric Company, Schenectady 5, New York.

431-78

*Progress Is Our Most Important Product*

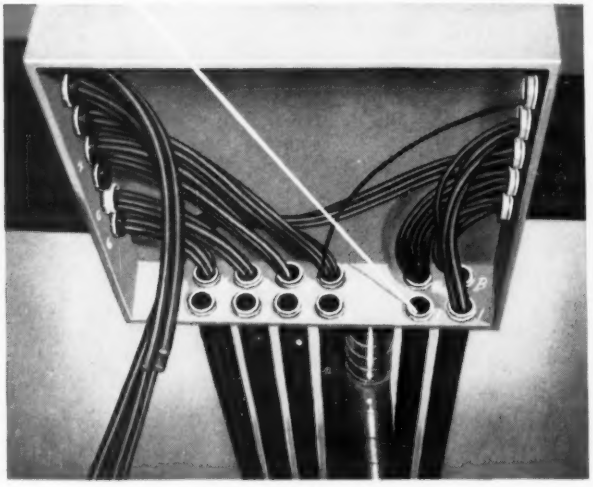
GENERAL ELECTRIC

**GIVE YOUR TRANSFORMER MANUFACTURER CREDIT FOR THE EXTRA VALUES HE GIVES YOU**

| | | G.E. | OTHER MFGRS. | | | |
|---|---|---|---|---|---|---|
| MEASURE LOAD BUILDING—do Co.'s other products build load? Does Co. sponsor load-building programs? | | | | | | |
| CHECK SERVICE—24-hour shipment? repair and uprating? emergency assistance? | | | | | | |
| COMPARE FEATURES—how many exclusive features in terms of longer life; reliability; easy maintenance? | | | | | | |
| ANALYZE PRICE—does Co. hold line against inflation with significant product developments? | | | | | | |
| EVALUATE INNOVATIONS—has Co.'s research paid off for you? Recent examples? | | | | | | |

**FILL IN THE BLANKS . . .** See which manufacturer gives you more for your transformer dollar: Mark "X" for a measurable contribution, "O" for insignificant contribution.

To meet today's ever increasing power demands...



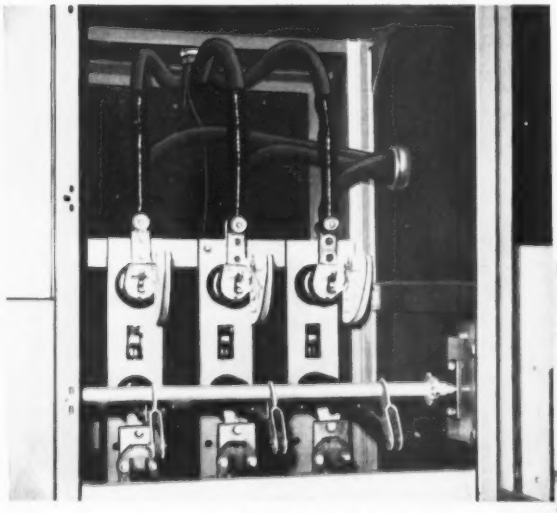
Paranite Paraseal* RHW, Type RR for duct.

IT'S

# PARANITE

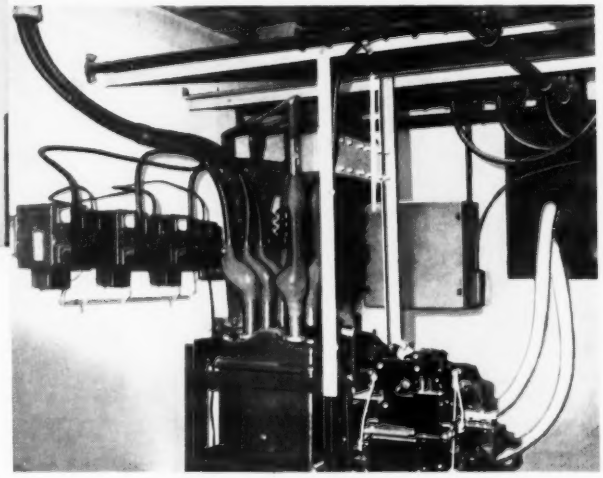
WIRE AND CABLE BEING SPECIFIED

for tomorrow's quality, dependable and trouble-free installations!



Above: Super Parause* RHW, Type RR for direct burial.

Below: Paranite Paraseal* RHW braided, for use in conduit.



Sales Offices in all principal cities — sold only through Recognized Electrical Distributors

**PARANITE WIRE AND CABLE DIVISION**

*Essex Wire Corporation*

**FORT WAYNE, INDIANA**

MANUFACTURING PLANTS: Marion, Ind.; Jonesboro, Ind.; Tiffin, Ohio; Birmingham, Ala.; Anaheim, Calif.

*For phone number of closest representative see advertising index in back of book.*

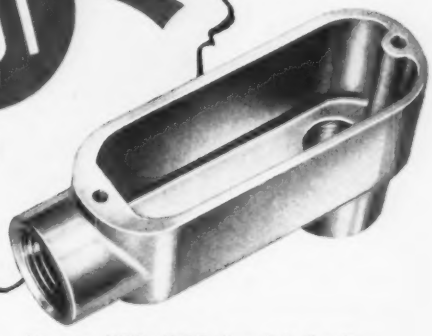
**INTERESTED IN GREATER PROFITS?**

*..of Course You Are!*

**WHEN YOU BUY...**

**Red DOT**

Fittings you can be sure of superior quality at prices that keep you ahead of your competition.



Warehouse inventories carried in the following cities:

Atlanta
Baltimore
Boston
Chicago
Cleveland
Dallas
Denver
Detroit
Greensboro, N. C.
Indianapolis
Kansas City
Los Angeles
Miami
Minneapolis
New York
Philadelphia
Pittsburgh
Portland, Ore.
Rochester
San Francisco

Mason RED • DOT Conduit bodies are offered in a complete range of styles and sizes.

Series "A" Conduit Bodies
Threaded for heavy wall rigid conduit. — Sizes up to 4".

Series "B" Conduit Bodies
Set-screw for thin wall conduit (EMT) electrical metallic tubing. — Sizes up to 2".

Cast Aluminum Covers available for all Bodies.

You will marvel at the appearance of these high-pressure aluminum fittings. Engineered for strength, these non-corrosive bodies will stand up under the most difficult conditions.

Precision machining guarantees ease of assembly.

Join the swing to RED • DOT — FOR GREATER PROFITS. Write today for the new illustrated catalog of the complete RED DOT Line.

Sold only through authorized Electrical distributors.

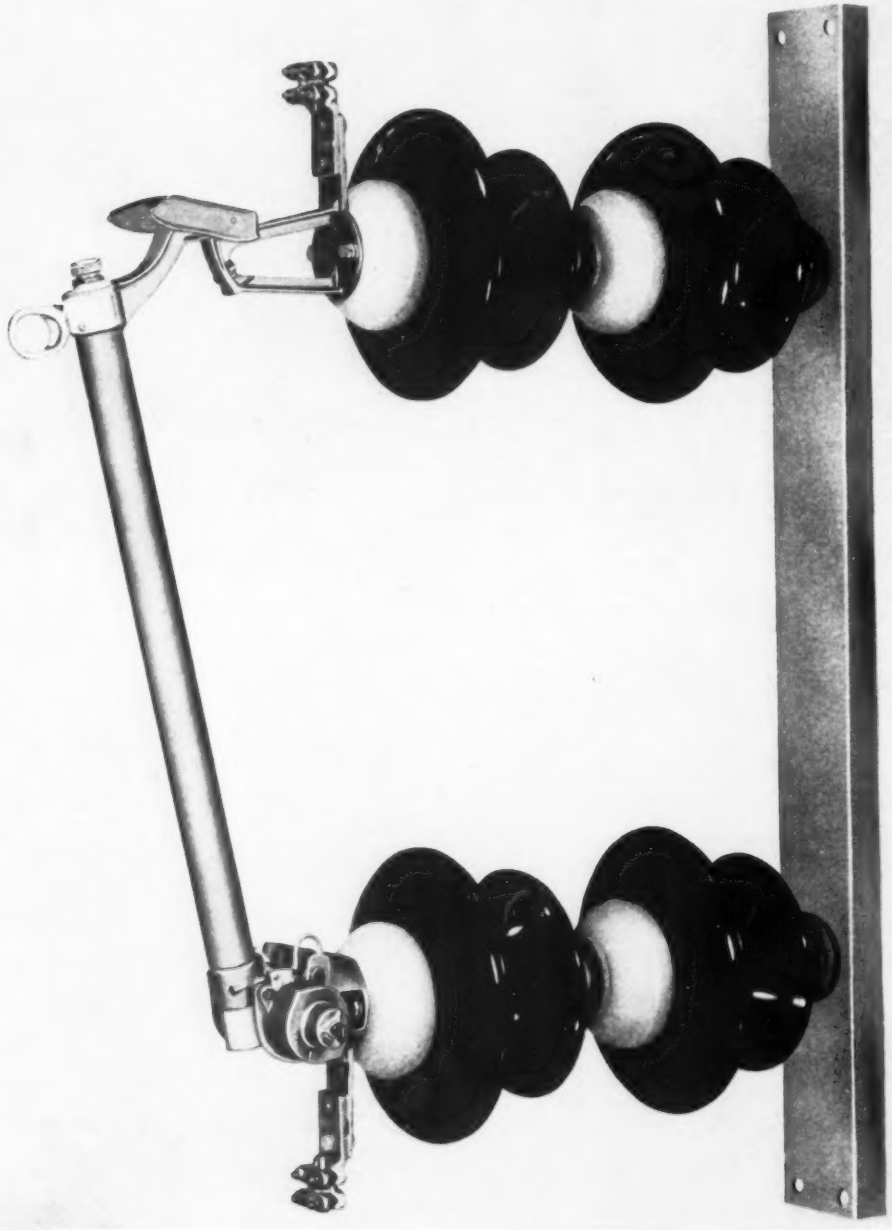
SERVING INDUSTRY Mason FOR 25 YEARS

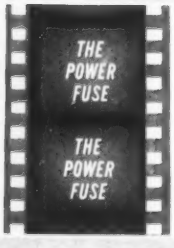
**L. E. Mason Co. BOSTON 36, MASSACHUSETTS**

*Visit us at N.A.E.D. Conference Booth No. 1110*

*For phone number of closest representative see advertising index in back of book.*

# An Economical New Family of






**New full color sound movie on power fuses now available to any interested activity**

Here is the dramatic story of the Power Fuse told in 25 minutes, including animated illustrations, actual field tests, and engineering data. Factual, up-to-date, informative. For a private showing, contact your Southern States representative or write direct to the company. (16 mm, color, sound.)

*For phone number of closest representative see advertising index in back of book.*

# Power Fuses by Southern States

- LOW INITIAL COST— LOW RE-FUSING COST
- INTERCHANGEABLE FUSE HOLDERS
- WIDEST SELECTION OF RATINGS
- SIMPLIFIED CONSTRUCTION

Engineers charged with the dual responsibility of adequate system protection at minimum cost will welcome this new family of Southern States Power Fuses—the greatest development in years!

The simplified design and construction of these powerful, reliable fuses result in immediate savings on initial costs, when compared with most other types.

Re-fusing in the field results in remarkable savings: For example, at 69 kv a comparative cost for re-fusing a 3-phase installation shows a price differential ranging as high as $422.00. Higher voltages reflect even greater savings.

When system demands increase, and higher ratings are needed, it is a simple matter to change fuse holders—using existing mountings—and thus reap additional savings.

The costly practice of applying a fuse with excessive interrupting capacity is no longer necessary. The widest possible selection of fuses in this new Southern States family permits fusing to meet exact requirements. Substantial savings, without sacrifice, can be made here!

With interrupting ratings approaching 3½ million kva at 161 kv, it will pay everyone concerned with power fuses to investigate this new family of power fuses. Contact your Southern States representative, or write direct for Technical Bulletin 59PF.

## COMPLETE FUSE KITS AVAILABLE

Clearly marked fuse kits are available at low cost for re-fusing Southern States Power Fuses *in the field*, easily and quickly. All components are sealed in moisture-free polyethylene bags. Kits are available in four speed ratios: PF (slow speed), PM (medium speed), PX (fast speed) and EEI-NEMA Type PE. Time-current characteristic curves are available for all fuses.

**PIONEERS IN POWER FUSES SINCE 1924**

**SOUTHERN STATES EQUIPMENT CORP.**
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

*For phone number of closest representative see advertising index in back of book.*

Armoring
is a
"Snap"
with...
FANNER
Superformed* RODS
Any hands are expert
No special skill is needed to expertly apply Superformed Products. When the last rod snaps into place you are assured of permanent, full-length gripping protection against mechanical and electrical damage.
The unexcelled Superforming process of making helical reinforcements is another development of Fanner's long years of specialized wire-forming experience. Write for catalog showing complete lines.
FIRST IN THE FIELD... AND CONTINUOUSLY IMPROVING ITS PRODUCTS THROUGH INDEPENDENT RESEARCH AND DEVELOPMENT
ARMOR RODS FANNSPLICES FANNGRIPS
LINEGUARDS PATCH RODS TAP ARMOR
PLASTIC FANNGUARDS KOVERGARD MOLDINGS
Fine Fanner Superformed Products
THE FANNER MANUFACTURING CO.
BROOKSIDE PARK CLEVELAND 9, OHIO
Electrical Products Division
*Trademark
Licensed for use under or made in accordance with one or more of the following patents: Patent No. 2,587,321, 2,700,478, 2,588,003 - - -

# ELECTRICAL BOOKS

ELECTRICAL MEASUREMENTS, 307 *pages*, 6x9, *by Arthur Whitmore Smith and M. L. Wiedenbeck, McGraw-Hill Book Co.*, $7.50.

This fifth edition has been prepared with two main goals in mind: (1) to give the intermediate student of physics and engineering a certain facility in handling work in electricity and magnetism from both the theoretical and the experimental standpoint; and (2) to prepare the student for further work in the fields of advanced electricity and electronics. It is a thorough revision of a highly successful work first published in 1914. It is noted for its treatment of principles, and its ability to stimulate the student to think for himself.

ELECTRICAL MEASUREMENT ANALYSIS, 143 *pages*, 6x9, *by Ernest Frank, McGraw-Hill Book Co.*, $8.75.

The purpose of this book is to develop in the student the attitudes and comprehension necessary for the analytical solution of problems arising in electrical measurement. Methods, concepts and analysis techniques are emphasized. Methods of measurement are classified into two major categories: null and deflection methods. Illustrations in each of these categories are developed in mathematical detail. Special attention is given to the ideas of measurement errors and their statistical treatment. A large number of problems at the ends of chapters call for originality and careful thought. Answers to all problems are given at the end of the book.

ELECTRICAL MACHINES, 563 *pages*, 6x9, *by Charles S. Siskind, McGraw-Hill Book Co.*, $8.

This very successful text presents the principles, practical applications, and operations of modern electrical power equipment. It discusses in detail virtually all types of modern equipment, such as generators, transformers, rectifiers, and manually and automatically operated electrical control systems. D-c machines and a-c machines are presented in separate sections of the book, but every effort is made to illustrate similar or dissimilar characteristics in the construction and performance of the two types of equipment.

SUCCESSFUL TECHNICAL WRITING, 287 *pages*, 5⅜x8, *by Tyler G. Hicks, McGraw-Hill Book Co.*, $5.50.

Step-by-step guidance in all phases of technical, engineering and scientific writing is given in this new book. Explaining in detail how to go about a writing job, it tells where to look for ideas, how to evaluate them, how to build an idea into an outline, how to write up the idea, and how to work with editors and publishers in getting the idea into print. In addition to sections on technical articles, reports, papers and books, including textbooks and handbooks, it also gives material on military and industrial training manuals and industrial advertising. The manual can be used by engineers, scientists and technicians who have never written before, as well as by established technical writers who wish to improve their skill.

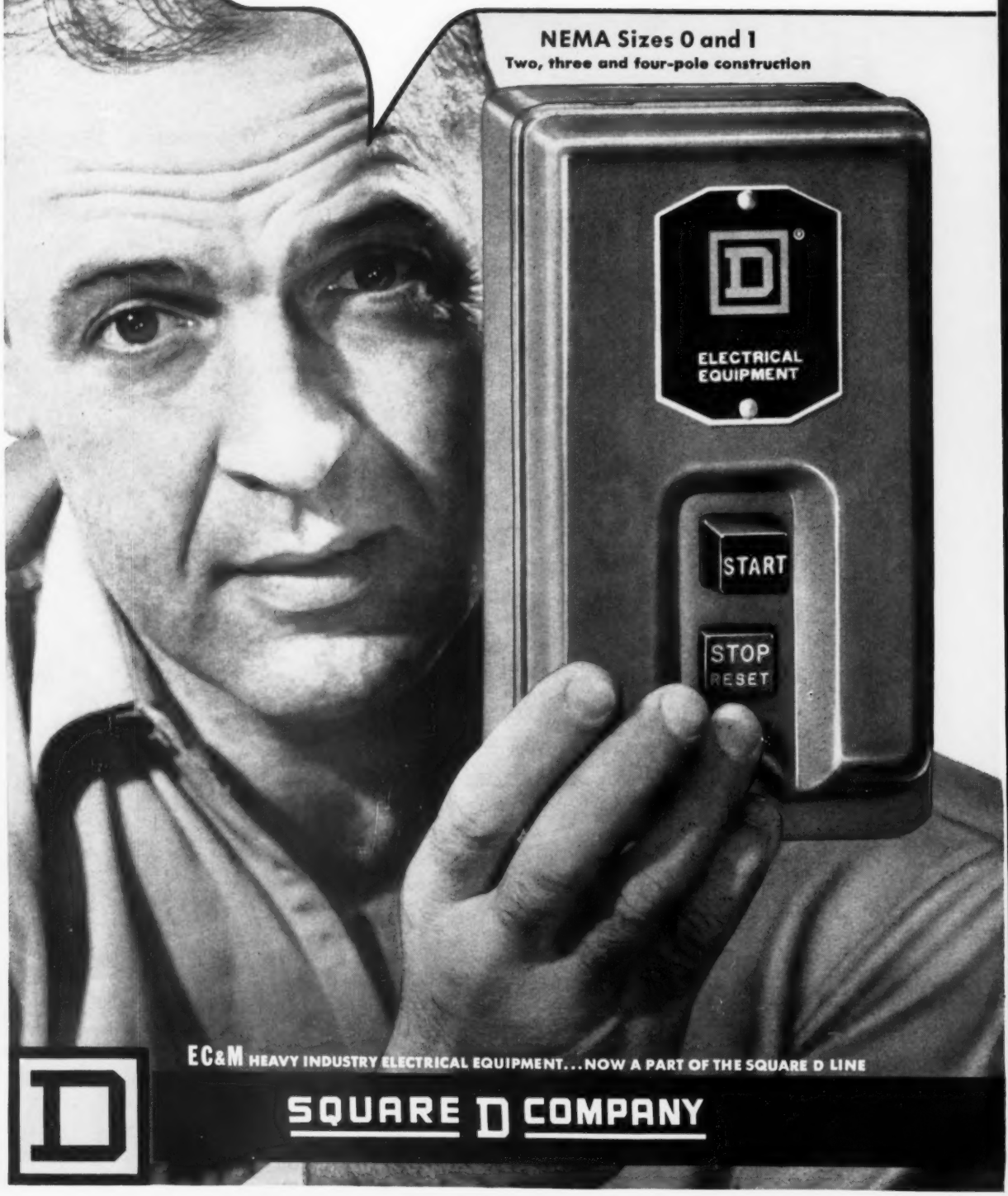
*For phone number of closest representative see advertising index in back of book.*

**...until you figure on this underfloor duct!** Here are four of the many reasons contractors have installed underfloor duct by Orangeburg in thousands of the nation's finest buildings: (1) It is light, easy to handle and to cut. (2) Its installed cost is exceptionally low. (3) Non-metallic, it lasts indefinitely. Corrosive action of cinder fill or concrete will not affect it. (4) It keeps a building "electrically modern" for its lifetime. New outlets can be tapped in easily and economically anywhere along duct line. Get the complete story before you figure your next job. Write Dept. WE-59 for Catalog 202.

ORANGEBURG MANUFACTURING CO. • Orangeburg, New York • Newark, California
*A Division of The Flintkote Company, Manufacturers of America's Broadest Line of Building Products*

**ORANGEBURG®**
*Underfloor Duct System*

# This NEW Manual




EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

# Starter has EVERYTHING!

***SMALLER!***
Takes less space, whether it's built into machine or mounted externally

***SMART STYLING!***
Matches the streamlined appearance of today's modern machines

***QWIK-MAKE, QWIK-BREAK!***
Positive snap action opening and closing of contacts. Longer contact life

***TRIP-FREE OVERLOAD PROTECTION!***
Impossible for operator to hold motor circuit closed against overload

***POSITIVE PROTECTION!***
Starter will not operate *without* overload units installed

***LONGER LIFE!***
*Toggle Action* operating mechanism. Heavy duty construction throughout

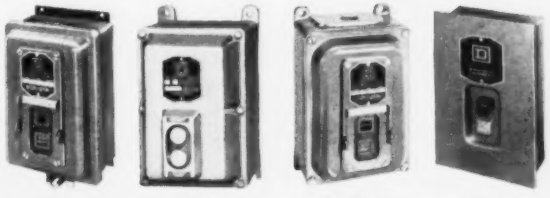
***EASIER INSTALLATION!***
Wire it without removing starter from enclosure. All terminals have pressure wire connectors

***EASIER MAINTENANCE!***
"Off-the-Shelf" parts kits make normal maintenance and modifications easier than ever. They're easy to buy, easy to identify, and faster to install

***TAMPER-PROOF!***
Cover padlocking device prevents tampering by unauthorized personnel. Safety latch locks "start" button in "OFF" position

***VISIBLE INDICATION OF OVERLOAD!***
Self-centering pushbuttons show when overload has occurred

## CHOICE OF ENCLOSURES



NEMA 12 Industrial Use Dust-tight | NEMA 7-9 Hazardous Locations | NEMA 4 Water-tight | Flush Mounting

Fractional-horsepower manual starters are available in a full line of enclosures including General Purpose, Flush Mounting, Water and Dust Tight, and Explosion Proof

***Write* for BULLETIN 2510 B-C**

***Address Square D Company, 4335 Valley Boulevard, Los Angeles 32, California***

*TRADE MARK "GUY-GRIP"

THE MODERN TWIST IN GUYING... APPLIES TO ALL MATERIALS

SEND FOR: "THE GOOD GUY," APPLICATION PROCEDURE, AND PRICE SHEET

PREFORMED LINE PRODUCTS CO.
DEPT. GG 1A
5349 St. Clair Avenue
Cleveland 3, Ohio

PATENTED — U.S. PATENT NUMBER 2,761,273

## ELECTRA'S HUSBAND

# "Down to Earth"

"HOW would you like to be the first man to go into orbit?" asked Electra, glancing up from the evening paper.

"That's a purely academic question," I replied. "I'm too old, too fat, too scared."

"Granted." Electra's alacrity in agreeing was not a bit flattering. "But don't you have a sense of feeling for history? This is a truly great age we're living in."

"All the sense I have right now is a sense of hunger. How's the roast coming anyway?"

"Be serious for once," commanded Electra. "Do you really think that they'll get a human being circling around the earth in our lifetime?"

"Sure I do. As a matter of fact, at the last convention a young scientist told the group that they were sure they'd have a man in orbit within the next two years and, what's more, they were sure they could bring him back alive and safe. He said that the experts figure that it's no more hazardous than taking up one of the new experimental supersonic fighters for the first time."

"That'll be the day," said Electra enthusiastically. "Why, when I was a girl anyone who got 20 miles away from the farm was considered a world traveler. Now they're talking about going around the world in 80 minutes. Where's it all going to end anyway?"

"Don't ask me. I haven't even had a ride on a new jet yet. All I can say is that times are changing so fast that I sometimes question whether we oldsters have minds sufficiently flexible to grasp all the implications."

"What do you mean by that?" asked Electra suspiciously.

"Well, it's just that those of us who grew up in the Model T era might have a little difficulty in evaluating the usefulness of all of these new and wonderful technological developments that have come along in the past few years. Maybe we have a tendency to resist change rather than jumping in and seeing how some of these new things could be applied right to our own little earth-bound orbits."

"Haw," crowed Electra. "You really fell into that one. When do I get a color TV set?"

"I wasn't exactly referring to the domestic situation," I replied huffily. "You just got me to thinking how it might be pretty frustrating for the bright, alert younger men in our business organizations who see so many problems that might yield to solution with some of these new processes and devices to have to wait for a decision from the top brass to try them out. And like as not, conservatism and sometimes just plain ignorance gives out a negative reply."

"Now don't start telling me again about the perils of the 'organization man,'" warned Electra. "The very thing you're talking about is exactly what turns those bright young rascals into dispirited 'yes' men after 10 years of butting their heads against the wall of inelastic thinking."

"I hate to admit it, but you're probably right. But it's awfully easy to sit back and say 'no' as long as the wheels are turning smoothly. The risks of trying to make them turn faster look pretty big when you apparently have 'got it made' the way things are."

"Looks to me like you corporation executives ought to set up departments of young men just to keep track of all the new things and dream up applications that might be tried out. And don't tell me you can't afford it because I'll bet they would more than pay their way by speeding up the time it takes now to overcome the inertia of mental laziness."

"You know, Electra, I'm real happy that you aren't my business boss. Now how about putting some jet propulsion on that dinner while I sit here and meditate on the sins of age?"

TEAR OUT AND FILE FOR FUTURE REFERENCE

*We invite you to LIFT the curtain as*

# Pennsylvania Transformer introduces a new distribution regulator...

Combining . . . for the *first* time . . . 2 outstanding Pennsylvania products:

❶

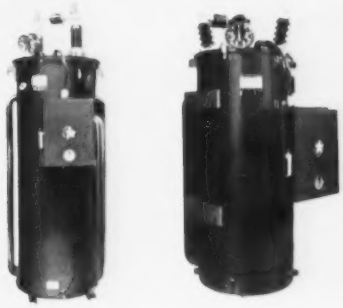
Patented Pole Star distribution transformer—with exclusive lap-on-top core

❷

Pennsylvania's load tap changing mechanism—proved in years of power-transformer service

*plus*

Mor-Amp feature to increase regulating capacity to 160% of rated current at reduced range



STATION TYPE POLE TYPE

## THE POLE STAR REGULATOR

TEAR OUT AND FILE FOR FUTURE REFERENCE

available now in

**27** single-phase distribution ratings

**VOLTAGE RATINGS: 2500, 5000, 7620, 13800, 14400**
**CURRENT RATINGS: 15 THROUGH 668 AMPERES**

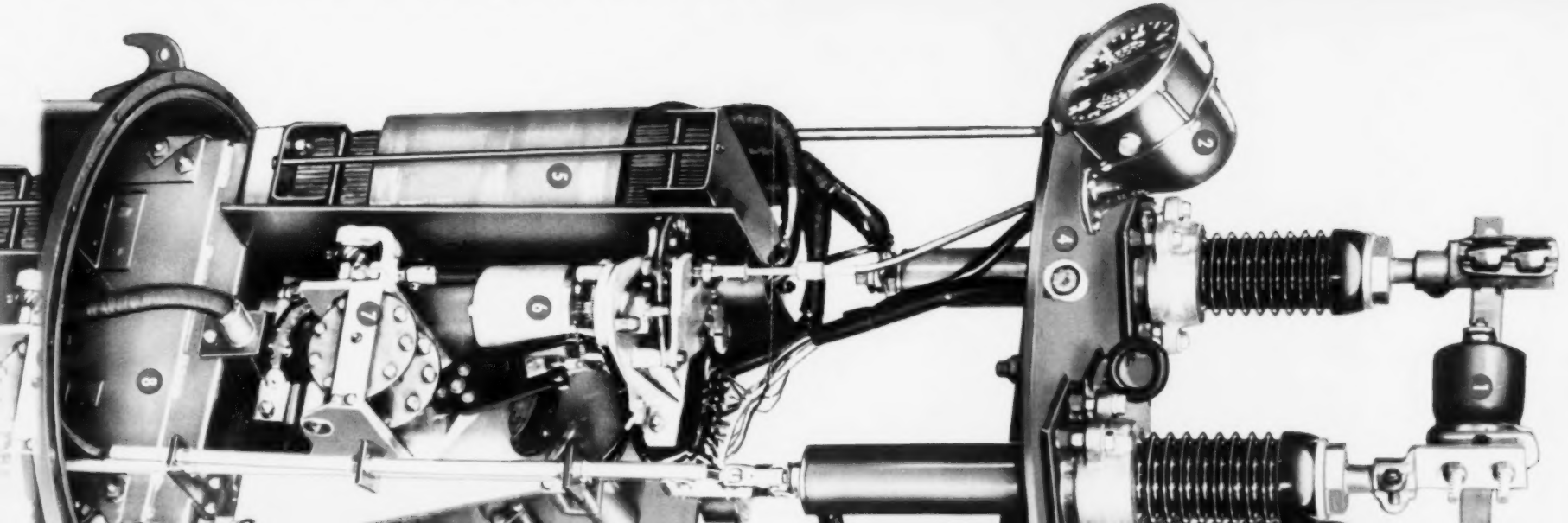
Designed for:
POLE MOUNTING
PLATFORM MOUNTING
STATION INSTALLATION
providing Pole Star reliability

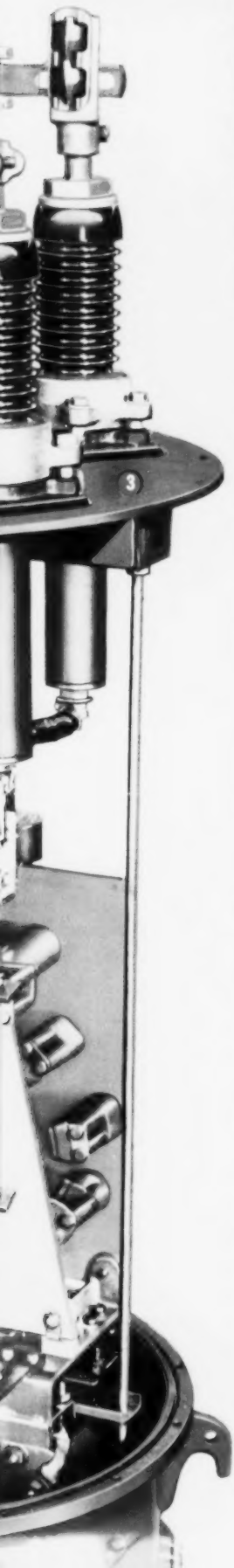
*plus*

the advantages of efficient, economical voltage regulation in 32 steps of 5/8%

**PENNSYLVANIA TRANSFORMER DIVISION**
McGRAW-EDISON COMPANY
CANONSBURG, PENNSYLVANIA

TEAR OUT AND FILE FOR FUTURE REFERENCE





# FACTS and FEATURES

## tell the story of the new Pennsylvania Pole Star Regulator ... designed to help your customers

## *LIVE BETTER ELECTRICALLY*

1. **Lightning protection** for the series winding is provided by a valve-type arrester.

2. **Cover location of position indicator** precludes all possibility of misalignment if unit is untanked for tap changer tests or inspection. Dial is tilted for easy reading.

3. **Unit construction** of internal assembly, cover, and cover accessories greatly simplifies periodic untanking for inspection.

4. **Standard jack plug** on cover connects controls to regulating mechanism. This simplifies relocation of control cabinet.

5. **Bridging reactor** prevents voltage interruptions and dips during tap changes.

6. **Direct-drive tap changing mechanism** gives the Pole Star Regulator many of the service-proved principles of Pennsylvania's power transformer load tap changers. Standard on all Pole Star Regulators rated 13800 and 14400 volts or with current rating from 321 to 668 amperes, the direct-drive tap changer is equipped with a reversible, single-phase, capacitor-type motor.

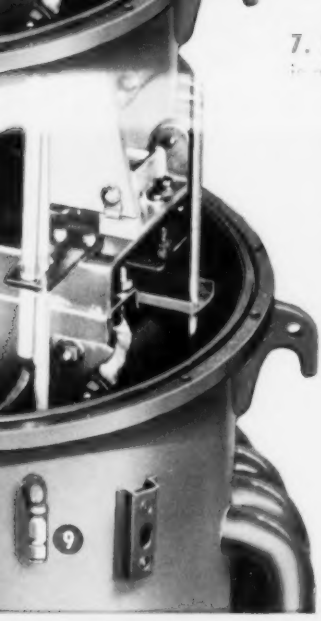
7. **Positive mechanical interlocking**

THE R

TEAR OUT AND FILE FOR FUTURE REFERENCE

PENNSYLVANIA POLE STAR R

Station-type, with Direct-drive Ta




7. **Positive mechanical interlocking** is assured by direct drive of contacts by means of a scroll cam and index plates. Flat-velocity switch speed reduces arcing and prevents contact erosion.

# REGULATOR

**AR REGULATOR**
**ve Tap Changer**

8. **Pole Star Distribution Transformer core-and-coil assembly** is used in all Pole Star Regulators. This includes patented lap-on-top core, which has established unexcelled records for low exciting current, low core loss, uniform quality.

9. **Screened uni-directional breather** allows for expansion of oil, prevents entrance of moisture or foreign matter.

10. **Oil-level gauge** is standard on all units.

11. **Control cabinet** may be easily removed for relocation at bottom of pole or elsewhere.

12. **Main panel is hinged** for easy access to fuse, arrester, potential transformer.

13. **Easy-to-grip control knobs** save operator's time and temper. Calibrations are large, can be checked at a glance.

14. **Tubes provide high cooling capacity.** Ends are expanded against openings in tank wall to assure tight fit, then are welded inside the tank.

15. **Structural steel base** on station-type units. Pole-type units have hold-down lugs for platform mounting, as well as hanger brackets.

Pole-Type and Station-Type . . .

# NEW PENNSYLVANIA POLE STAR REGULATOR offers performance-proved reliability in all single-phase distribution sizes

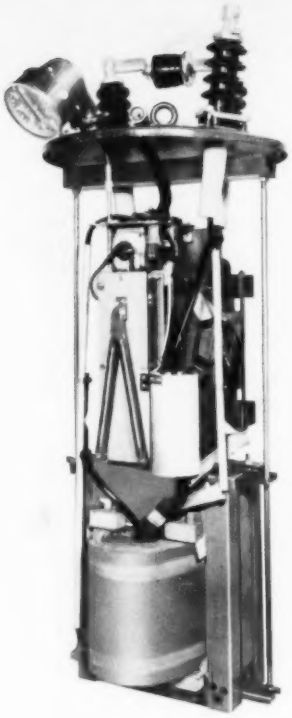
Although new in itself, the single-phase Pole Star Regulator is a product of Pennsylvania Transformer's highly successful, long-term experience in two related fields: distribution transformers and power-transformer load tap changers. As a result, Pennsylvania is able to introduce the Pole Star Regulator in a *complete range of distribution sizes* (a total of 27 different ratings) . . . and with design and construction features that point to economical, sustained performance in *pole-top, platform and station installations.*

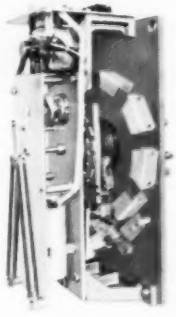
### 10% Regulation in 32 Steps of 5/8%

The features described elsewhere on these pages are yours with the time-proved advantages of 32-step regulation. Voltage is efficiently controlled in 5/8% steps over a range of plus or minus 10%. The normal operating band is plus or minus 1 volt, with a time delay of 10 seconds to avoid unnecessary changes. Both the operating band and time delay can be varied to fit local conditions.

### Light in Weight, Easy to Handle

Throughout the entire range of sizes, the Pole Star Regulator offers size and weight advantages that mean easier handling . . . faster, more economical installations. Specific details are given in Bulletin PSR-958. For a copy—or a quotation on your next regulator requirements—write to Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.





POLE STAR

EASY-TO-ADJUST **MOR AMP** FEATURE

## and other convenient controls give maximum flexibility

Controls for the Mor-Amp feature —which permit regulating capacity to be increased to as much as 160% of rated current—are located on each side of the position indicator. Separate scales for "raise" and "lower" Mor-Amp settings are located on the face of the dial.

Mor-Amp is one of many easy-to-use adjustment features that permit wide flexibility in the use of Pole Star Regulators. Voltage level can

be varied from 110 to 140 volts . . . time delay from 10 to 120 seconds . . . operating band from ±¼ to ±6 volts . . . and both reactance compensation and resistance compensation from 0 to 24 volts. Such flexibility, coupled with Pole Star dependability, will help your customers to *live better electrically.*

## Internal assembly of pole-type Pole Star Regulator with spring-drive tap changer

Design and construction details for the pole-type Pole Star Regulator are essentially the same as for the station-type regulator shown on the inside fold. For units rated 7620 volts and below and with current ratings 320 amperes and below, the high-speed, arc-resisting tap changer shown here is used.

A single-phase, reversible-drive motor loads tension springs that provide energy for the rapid switching action. Tap position is accurately shown by the position indicator at all times, with no chance of misalignment.

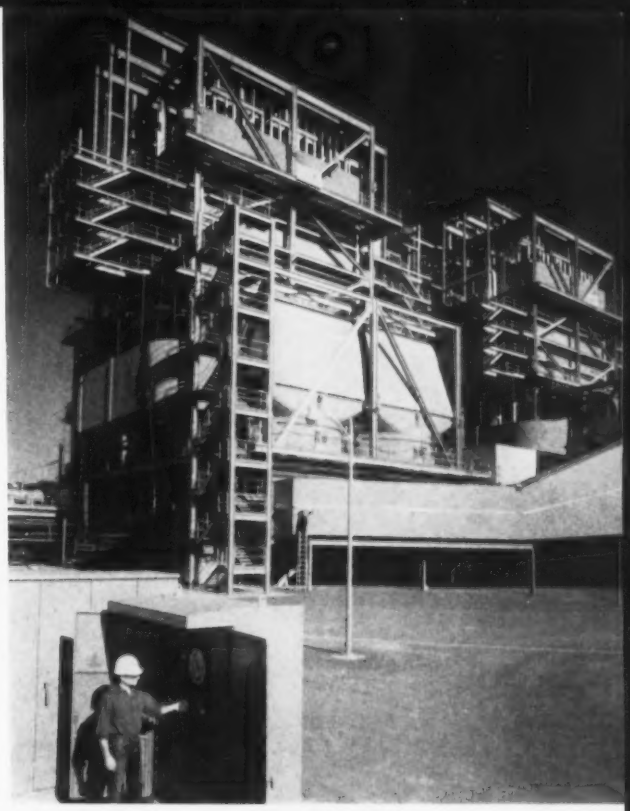
**PENNSYLVANIA TRANSFORMER DIVISION**
McGRAW-EDISON COMPANY
CANONSBURG, PA. • Greater Pittsburgh District

McGRAW EDISON

**ELECTRICAL WEST**

VOL. 122, NO. 5
MAY 1959

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.



**When Southern California Edison adds unit No. 3 to its Huntington Beach station, it will pioneer the West's . . .**

# First Once-Through Boiler

**J. B. Moore,** Assistant Chief Mechanical Engineer, Southern California Edison

The boiler for the third unit at Southern California Edison's Huntington Beach steam station will be of the once-through universal pressure type. This change from the conventional natural circulation boiler is a transition that many observers feel will be the pattern for future steam generation. In making the change, Edison expects to realize a saving in plant first cost over conventional boilers. This boiler will supply steam to a turbine-generator unit essentially the same as those presently installed as Units 1 and 2 at Huntington Beach. Unit 3 as planned will be a 210,000-kw, cross compound, axial flow turbine-generator with operating conditions of 2,400 psi full load throttle pressure, 1,050 F main steam temperature and 1,000 F reheat temperature.

The universal pressure boiler, until recently, has been unknown in electric utility service in the United States. European utilities, on the other hand, faced with a much different balance between the cost of material and labor, have found it advantageous to take the lead in the development of this type of boiler. The continuing trend to higher steam pressures and temperatures, as well as ever larger station sizes, however, has brought our industry to the point where the universal boiler has economic as well as operating advantages. The first u-p boiler to operate commercially in the U. S. was at the Philo plant of Ohio Power Co. The Philo plant, operating at above critical pressures, has given successful operation for two years.

There are no inherent thermodynamic advantages in the adoption of the u-p boiler. However, unit 3 will have an improved heat rate, but this is the result of an additional feedwater heater in the cycle.

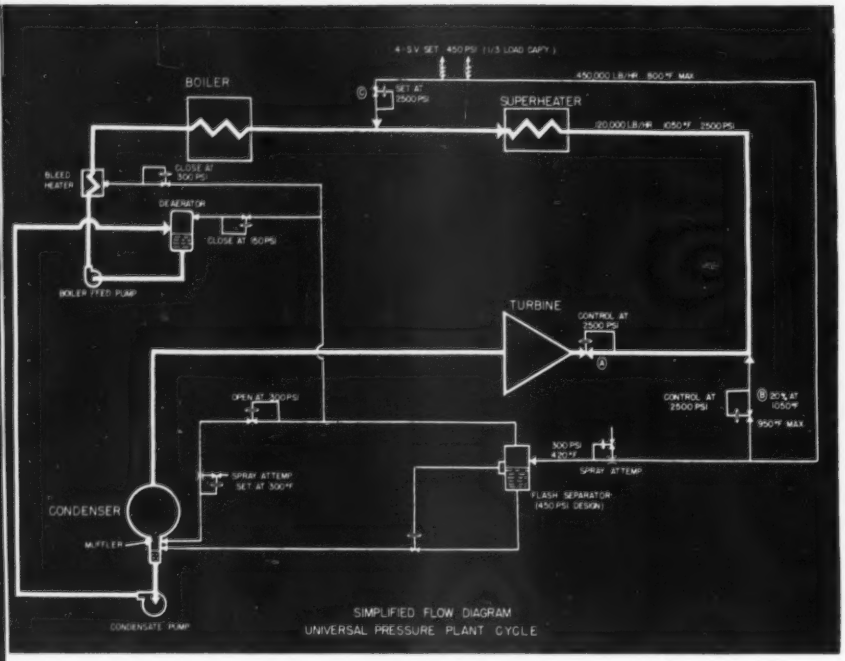
The selection of a u-p boiler is a more far-reaching decision than the selection of a new kind of boiler might imply. The new boiler's characteristics require that nearly every concept accepted for Huntington Units 1 and 2 be revised for the operation of the new unit.

## New Control System

Probably the most important departure is in the control system. The big difference arises from the fact that the u-p boiler *does not store energy* in the form of usable steam. Two of the four turbine control valves will be full open from the 33% steam flow minimum required by the boiler to 64% output. As a result, electrical output is controlled directly by increase or decrease of feed pump pressure with change in fuel input to maintain superheat temperature. Electrical output is controlled at loads above 64% by the second pair of turbine valves at full pressure as with conventional natural circulation boilers. However, anticipatory control signals to feedwater pressure and fuel input will be directly from the load frequency controller rather than from change in steam flow as with the conventional boilers. This mode of operation will most nearly match the optimum turbine thermal performance curve. The charts show the schematic operation of the u-p boiler as well as the control diagram and curve illustrating turbine and feedwater pressure characteristics.

## By-Pass System

An external superheater and turbine by-pass system will provide




**Universal pressure flow diagram shows how boiler feed maintains pressure on turbine. Lighter lines show startup loop and its relation to station components**

a circulation path for protection against overheating during startup and shutdown at flows below one-third of full flow. Some Edison company engineers have referred to this system in jest as "Der Heaten Gedumpen Loop" because of its German origin.

This by-pass system will be subjected to severe service since the temperature and pressure can vary from low pressure cold water to flashing mixtures and later full pressure high temperature steam. Exhaust from this system will be to the condenser through a desuperheater, flash tank and muffler system.

## Feedwater Quality

Early experience with u-p boilers pointed up the requirement for absolute water purity. Since this time, the requirement for water purity in conventional high pressure boilers has increased to the point where there will be no significant difference in the water treatment required for the u-p boiler over that required for the natural circulation boilers at the same station.

In reviewing the characteristics of the u-p boiler for operation at Huntington Beach No. 3, the following characteristics were evaluated in making the decision in favor of the u-p boiler.

## Advantages

1. Constant steam temperature through full operating range. With the steam pressure pegged by the boiler feed pumps, the boiler is fired to maintain constant temperature. In a conventional system, firing maintains boiler drum pressure while steam temperature control is achieved with recirculating fans, spray attemperators and related control devices. Freedom from the requirement for such temperature control equipment is evaluated as a "plus" for the u-p cycle.

2. Rapid response to load change. Rapid response to large increments of load change, while not a frequent requirement, is a valuable asset in the event of emergencies.

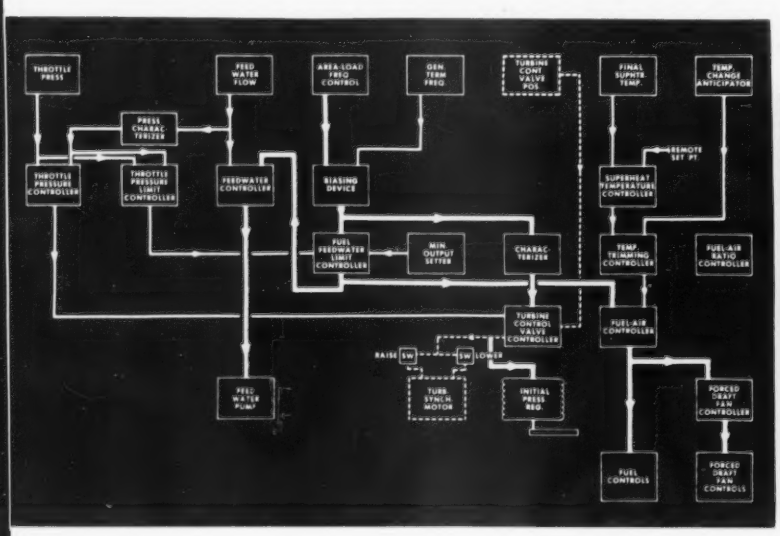
3. Quick startup and shutdown. The requirement for low drum temperature differential that has impeded startup rates is no longer a limitation. Shortened startup and shutdown time will allow faster return to service after outage.

4. The small tubes associated with the u-p units offer advantages associated with forced circulation boilers without the disadvantages of flow controlling orifices.

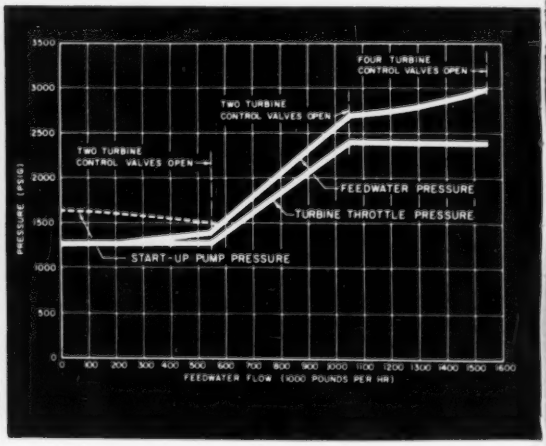
5. Simplified control system during normal operation.

6. Minimum operating complications when turbine is tripped.

7. Saving in throttling loss at turbine admission valves and boiler




**Left, new boiler-turbine control system; right turbine and feedwater pressure characteristics**



The continuing trend to higher | that the u-p boiler *does not store* | bine by-pass system will provide



feed pump power during reduced load operations.

8. Complete flushing of boiler system during each startup and shutdown.

9. Reduced dependence on safety valves.

10. Elimination of drum level gage glass. Gage glass maintenance today approximates eight man-hours per week per gage glass.

11. Ease of acid cleaning. Huntington No. 3 will have a built-in system by which acid cleaning of the boiler will be accomplished in approximately half the time previously required.

12. Freedom from boiler drum problems. In addition to savings in costly transportation and lifting of the boiler drum, the adoption of a system that does not require a drum is considered a real advantage. Discernible flaws in the heavy plate required for drums have forced costly construction delays in six of the 10 units recently purchased by Edison. In addition, concern about undetected flaws is eliminated by absence of the drum.

13. Boiler configurations more flexible. Costly superheat, hot reheat and cold reheat steam piping footages reduced by approximately one-third.

14. Inherently lower boiler costs erected because of less weight in boiler, its support and its water load. In the Huntington Beach area this means importantly less seismic force to be offset.

### Disadvantages

1. Minimum practical load is limited to one-third of full load. This limitation grows out of the fact that equal circulation through all circuits cannot be maintained at lower flows. This minimum load at rated temperature and reduced pressure is a balance between minimum acceptable unit output and maximum acceptable pressure loss at full load.

2. Additional boiler feed pump power required due to 650 psi loss to the u-p design at full load.

3. Requires a complex by-pass system for startup and load rejection. This is a drawback in terms of plant cost. This by-pass system is largely responsible for the favorable quick startup features and the pre-start flushing feature of a u-p plant.

4. Additional re-engineering incidental to change in boiler design. This disadvantage only applies since similar turbine-generators are installed for Units 1 and 2 and would not exist for a plant of entirely new design.

# Water Supply Forecast

**Homer J. Stockwell**
Snow Survey Supervisor, Soil Conservation Service
Fort Collins, Colo.

**Norman S. Hall**
Snow Survey Supervisor, Soil Conservation Service
Reno, Nev.

Crews check snow's depth and water content

THIS year the water supply from the snow pack in high mountain watersheds of the West ranges from normal in Washington, northern Idaho, Montana, Wyoming and northern Colorado to critical shortages in parts of California, southeastern Oregon, Nevada, most of Utah, Arizona, New Mexico and southwestern Colorado.

However, excellent carry-over reservoir storage from last year will assure generally adequate supplies for agricultural, municipal, industrial and hydroelectric uses.

In the Columbia River basin, tributaries from the north are expected to have normal or better runoff. Watershed soils beneath this snowpack are wet. On the upper end of the Snake River at Moran, Wyo., normal flows are anticipated. In southeastern Oregon and southern Idaho, a light snowpack and dry soils combine to give a very poor outlook for snowmelt runoff.

East of the Rocky Mountains, water supplies will be sufficient to satisfy usual demands. Mountain snowpack, soil moisture and existing reservoir storage point to adequate supplies.

The California Department of Water Resources reports that snowmelt runoff from mountainous areas will vary from near minimum of record in the southern San Joaquin Valley to near normal in the northwestern part of the state. Reservoir storage is good. South of Sacramento, where carry-over storage or importation is not adequate, agricultural water supply will be limited.

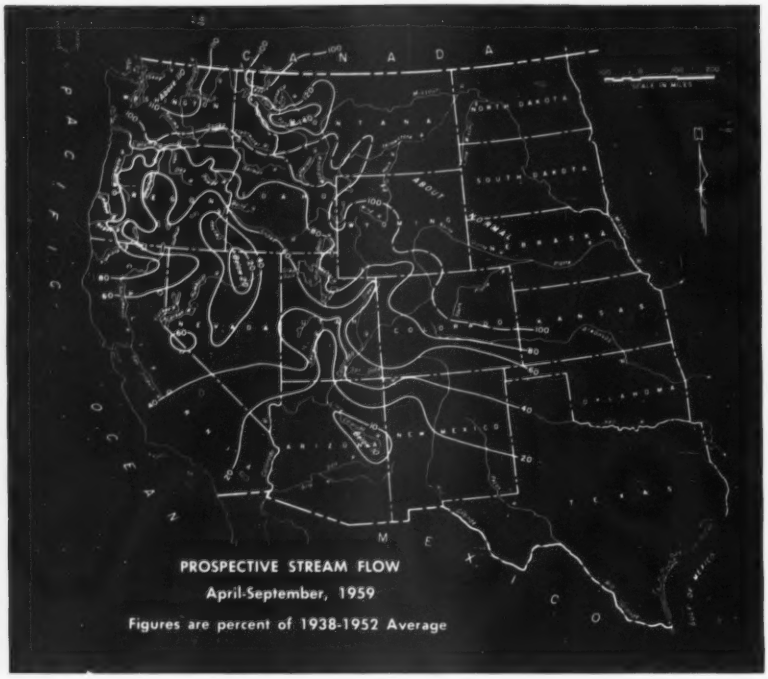
In Nevada, southern Utah, southwestern Colorado, Arizona and New Mexico, water users who must depend on natural streamflow are faced with critical shortages. However, reservoir storage in this area is good and will provide reasonably adequate supplies for agricultural, industrial and hydroelectrical requirements.

These forecasts for 1959 water supply are based principally on measurements made by the U. S. Department of Agriculture, Soil Conservation Service and many cooperators* on some 1,300 snow courses and 100 soil moisture stations. Carry-over storage in reservoirs, soil moisture condition of irrigated land and relative demands as compared to supply are considered in an appraisal of water supply outlook.

To indicate general streamflow prospects for major Western streams, the following forecasts are listed for the April-September 1959 period and compared to normal: Columbia River at The Dalles, Ore., 96,500,000 acre-ft or 99% of normal; Missouri River at Fort Benton, Mont., 3,341,000 acre-ft, 99%; Colorado River at Grand Canyon, Ariz., 7,300,000 acre-ft, 73%; Sacramento River inflow to Shasta Reservoir, Calif., 2,000,000 acre-ft, 85%; San Joaquin River below Friant Reservoir, Calif., 745,000 acre-ft, 55%; Rio Grande at Otowi Bridge, N. M., 280,000 acre-ft, 33%.

The chart showing the status of reservoir storage and a map indicating the approximate water conditions forecast for each area summarize the 1959 water supply outlook for the West. The following paragraphs taken from the forecast

*The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Forest Service, Geological survey, other federal bureaus, various departments of the several states, irrigation districts, power companies and others. The California State Department of Water Resources, which conducts snow surveys in that state, contributed the California figures appearing in this article.




show where trouble spots may be expected.

**Arizona**—An exceptionally dry March has been added to an already deficient moisture year. As a result, the January through May runoff in the state will average only 20% of normal. However, reservoir storage is 84% of average. The water supply for the land served by reservoirs on the Salt and Verde Rivers is adequate for this year. The available water in the San Carlos and Carl Pleasant reservoirs will be short of a full supply but will not require drastic curtailment of normal cropping operations. In the limited areas where only direct diversion of spring runoff is available, the water supply will be short.

**California**—The California Department of Water Resources reports that the water supply outlook is for below average runoff in all areas of the state. Snowmelt runoff from mountainous areas will vary from near minimum of record in the southern San Joaquin Valley, where extensive agricultural development exists, to near average in the extreme northwest portion of the state where most of the water must be wasted to the sea because of geographical limitations of the region.

Precipitation was below average in all but portions of the extreme northern section of the state, where near or slightly above average amounts were recorded. Snowpack was also below average in all but the same areas. A very dry, warm March contributed little to the snowpack and in many cases caused premature snowmelt with resultant depletion of the lower elevation snowpack. It is estimated that the snow-stored water is about 60% of average for the state as a whole. Water stored in surface reservoirs is about 105% of average for April 1.

Water supply conditions in the area south of Sacramento will limit agricultural use where carry-over or importations are not adequate. Water will be available for municipal and industrial use in virtually all areas of the state.

**Colorado**—The water supply outlook is relatively good for the Platte and Arkansas Rivers east of the front range in Colorado. Mountain snow accumulation to April 1 is normal or better, soils in irrigated areas are moist and surplus storage carried over from the past two heavy streamflow years will help to provide a supplemental supply should the summer months be dry. A substantial amount of water is stored in the larger reservoirs, including John Martin on the Arkansas, in the Colorado-Big Thompson and in Denver municipal reservoirs on the South Platte. Stream flow on the lower Platte was above normal during the winter, so reservoirs will fill by the start of the irrigation season.

For northwestern Colorado, including the upper Colorado River, streamflow will be slightly less than normal, but adequate to meet all but late season demands. Some shortage probably will occur on Gunnison River tributaries.

Seasonal snowfall has been light on the San Juan, Dolores and Rio Grande drainages. Streamflow for 1959 on all of these streams will range near one-half of normal. Severe shortages, comparable to the 1954-56 period, are in prospect. The only favorable item is higher groundwater levels in San Luis Valley as compared to these drought years. The use of ground water again will be extensive. The shortage will be most severe on the Dolores River.

**Idaho**—The snowpack is light along rivers in southern Idaho so the outlook is for a low water supply. Reservoir-stored water can make up for deficiencies in natural streamflow but, on those rivers without adequate storage, a serious water supply shortage is in prospect. Dry soils beneath the light snowpack indicate an early recession in streamflow during the irrigation season. Carry-over storage from 1958, however, is excellent on all rivers and will give major southern rivers, such as the main stem Snake, Boise and Payette, a normal supply when considering the reservoirs involved in this area.

**Montana**—The water supply outlook for Montana is fair to excellent for the 1959 irrigation season. Missouri River Basin streams are expected to flow from 80 to 114% of average with Columbia River tributaries forecast at 109 to 166% of average. An exceptionally heavy snowpack covers the headwaters of the Swan and Blackfoot Rivers and Mission Range with measurements all above previous records covering 20 years. This is likely to cause high water on the Blackfoot and Clark Fork Rivers above Missoula and also in the Swan River to Big Fork.

Soil moisture conditions under the snowpack and in irrigation areas are relatively good. Irrigation and power production reservoirs contain slightly more than average carryover storage this April 1.

**Nevada**—Water users who do not hold reservoir storage rights are faced with critically short supplies. Fortunately, reservoir storage is above normal and those who do have storage rights can expect adequate, but limited, supplies.

Forecasts on the Owyhee River in northern Elko County are for about 20% of normal streamflow, 12% on the Humboldt River at Palisade and about 50% on the Walker, Carson

design.

ever, reservoir storage in this area

which conducts snow surveys in that state, contributed the California figures appearing in this article.



and Truckee-Tahoe. Central, eastern and southern Nevada, with no reservoir storage, face a short-water season.

April 1 storage in seven important reservoirs was 78% of capacity or 120% of the 1938-52 normal. Lake Tahoe stores 563,000 acre-ft at elevation 6,227.63 ft above sea level, and is not expected to approach the legal maximum. Rye Patch reservoir on the lower Humboldt is 123% of the April 1 normal. Bridgeport and Topaz reservoirs on the Walker River system are full.

**New Mexico**—Following two good water years, a severe shortage of irrigation water is in prospect for the Rio Grande through New Mexico. Snowpack is less than 50% of normal on the watershed in Colorado and New Mexico. Above Elephant Butte, water shortage will be similar to that experienced in the 1953-56 period. The outlook below Elephant Butte in New Mexico and Texas is improved because of more than 1,000,000 acre-ft in storage. However, with minimum inflow forecast to Elephant Butte, the outlook is considered fair to poor in this area.

**Oregon**—Water content of the mountain snowpack in Oregon averages only 61% of the April 1 normal. The soil mantle under the mountain snowpack is still only partially wet except on the main Cascades and in the northeastern Oregon counties where moisture penetration is satisfactory. Soils in southeastern Oregon are exceptionally dry.

Stored water in 22 irrigation reservoirs is 110% of the average April 1 amount. Good carry-over supplies from last year help to make the outlook this year more favorable. Reservoired water will literally "save the day" for many areas this season.

Forecasts of April-September run off range from lows of 17 and 26% normal on Owyhee and Silvies Rivers to near 100% on the Applegate, Illinois and Wallowa Rivers. Other forecasts for the April-September runoff (in percentages of normal) are as follows: Malheur River, 55; Burnt, 60; Powder, 68; Grande Ronde, 68; Umatilla, 86; Walla Walla, 77; John Day, 76; Crooked, 18; Deschutes, 74; Willamette, 85; North Umpqua, 85; Rogue, 69; Klamath Lake, 90; Chewaucan, 55; Blitzen, 56.

**Utah**—A fair water supply is in prospect for the area bounded on the north by the tributaries of Bear River in Idaho and Wyoming, and on the south by the upper Duchesne River and the streams draining into Utah Lake. Most streams here will yield from about 70 to 95% of average flow. South of this area to the Arizona state line and in the Uinta Basin, other than the upper Duchesne, the outlook is for only fair to critically short water supplies. In this area forecasts vary between 16 and 76%, with most forecasts in the 30 to 60% range. Reservoir storage in the state generally is above average and will prove to be a vital factor for those having rights to its use.

**Washington**—Snowpack in the State of Washington varies from 75% to 145% of normal. Forecasts of streamflow vary from 75% to 121% of normal. Snowfall has been very good in the northern part of the state and in the tributary basins of the Okanogan, Similkameen and Pend Oreille Rivers. Snowpacks are below normal in those watersheds that lie south of the Wenatchee River along the east slope of the Cascades and south of the Skykomish River west of the Cascades.

The soil mantle beneath the snowpack is wet, as indicated by soil moisture measurements. Reservoirs used for irrigation and power show above normal storage for this time of year.

Substantial gains have been made in the snowpack during the late winter months. The water supply picture, then only fair, has improved to its present state of good over most of the state.

**Wyoming**—The water supply outlook for Wyoming irrigated areas is relatively good. Streamflow will generally be near to or only slightly below normal. There is, however, an area of snowpack deficiency on the Popo Agie watershed. The snowpack on a small area of the northern slope of the Bighorn Mountains is at a record high, but the record period is short.

With near normal inflow and carry-over storage, the water supply along the North Platte is good, although there may be some deficiency on the Laramie and smaller tributaries. Soil moisture in irrigated lands is good.

The flow of the Bighorn River will be below normal. Storage in Boysen reservoir as well as in smaller irrigation storage reservoirs on the Wind River is very low. Inflow to Buffalo Bill reservoir on the Shoshone River is expected to be near average but storage is very low.

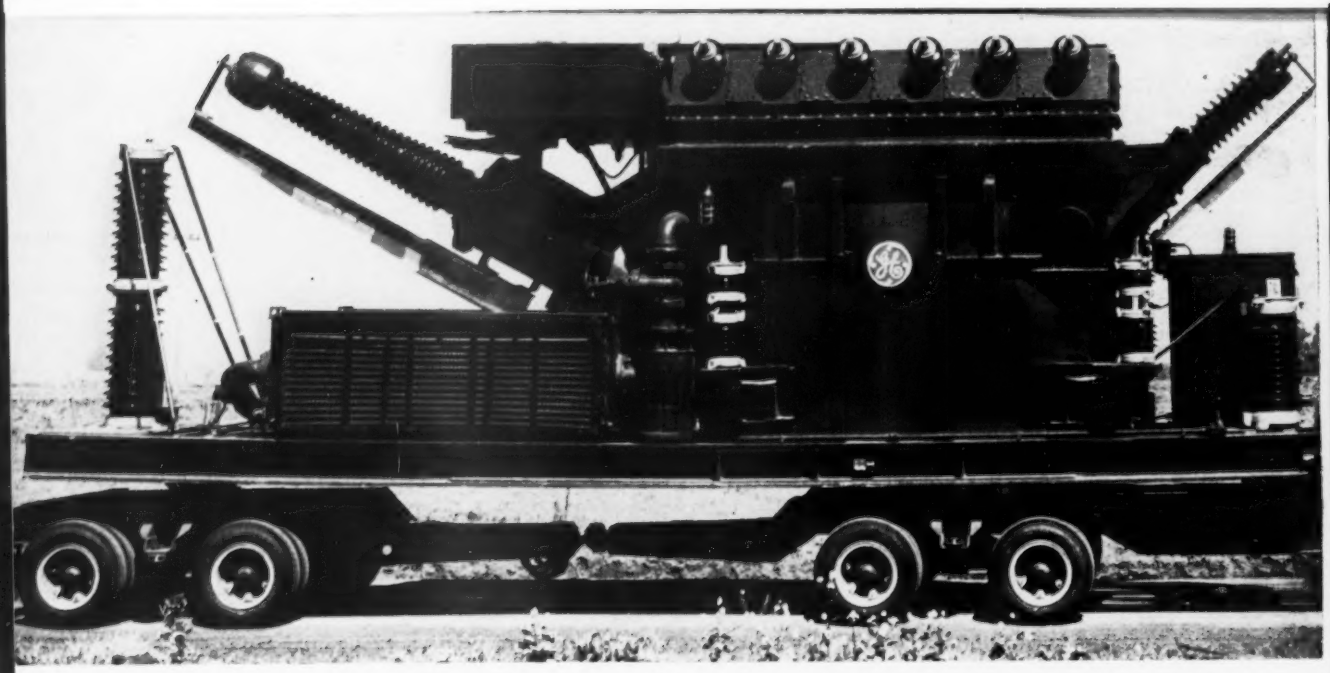
The flow of the Green River will be generally less than average but will be adequate to meet local water demands.

*STORAGE IN LARGER RESERVOIRS NOT INCLUDED ABOVE*

| NAME OF RESERVOIR | USABLE CAPACITY 1000 AF | USABLE STORAGE 1000 AF APRIL 1, 1959 |
|---|---|---|
| ARIZONA | | |
| LAKE MEAD | 27,207 | 20,680 |
| LAKE MOHAVE | 1,810 | 1,755 |
| LAKE HAVASU | 619 | 564 |
| CALIFORNIA | | |
| FOLSOM | 1,010 | 562 |
| BERRYESSA | 1,600 | 1,012 |
| VERMILION | 125 | 62 |
| CHERRY VALLEY | 268 | 54 |
| PINE FLAT | 1,001 | 638 |
| ISABELLA | 552 | 191 |
| CACHUMA | 206 | 203 |
| COYOTE | 122 | 72 |
| NACIMIENTO | 350 | 212 |
| WISHON | 128 | 83 |
| IDAHO | | |
| CASCADE | 654 | 407 |
| ANDERSON RANCH | 423 | 291 |
| LUCKY PEAK | 278 | 181 |
| PALISADES | 1,202 | 724 |
| MONTANA | | |
| FORT PECK | 18,800 | 9,637 |
| CANYON FERRY | 2,043 | 1,774 |
| FLATHEAD LAKE | 1,791 | 883 |
| HUNGRY HORSE | 3,500 | 2,286 |
| TIBER | 1,316 | 720 |
| NORTH DAKOTA | | |
| GARRISON | 13,805 | 3,966 |
| SOUTH DAKOTA | | |
| FORT RANDALL | 4,900 | 2,979 |
| WASHINGTON | | |
| ROOSEVELT LAKE | 5,072 | 2,672 |
| BANKS LAKE | 762 | 764 |

*Kansas storage includes storage in John Martin and Great Plains Reservoirs in Colorado. Texas includes Red Bluff Reservoir in Texas and Elephant Butte and Caballo Reservoirs in New Mexico.*

amounts were recorded. Snowpack [illegible] the upper [illegible] River, about 30% on the Walker, Carson



40,000-kva, 220/110/60-kv mobile transformer as it appears on special steering beam trailer

# PG&E's Mobile Power Transformers

- **Put spares to work**
- **Speed service restoration**
- **Save money**

**Roy F. Stuart,** General Superintendent, Substations, Pacific Gas and Electric Co.

Pacific Gas and Electric Co.'s 220/110-kv transmission grid includes 21 transformer banks, located at 13 different substations. These banks are composed of three single-phase transformers, each rated 24/30/40 mva. Several years ago the policy of maintaining a spare transformer at each bank was discontinued in favor of an area spare. Today seven spare transformers are available for a whole system. Each of these spare units is suitable for a limited number of applications as a result of tap voltage limitations, tertiary voltage, impedance, etc.

These seven spare transformers have a present-day value of nearly $1½ million. This large investment in nonproductive transformer capacity suggested that other means should be investigated to supply spare capacity.

Equally important was the requirement that service at a major substation be restored as rapidly as possible. In 1956 the failure of a power transformer at Midway substation required that the area spare be brought to the site and placed in service. A study of this actual occurrence showed that a period of 72 to 96 hours was required for the changeout.

Moving stationary transformers of this size implies weight limitations in excess of that allowed on state highways, and in some cases shipping heights greatly in excess of normal bridge and underpass clearance. Because of these physical limitations, each move was a production requiring special routing and a special permit from the state.

## Explore Mobiles

The conflicting requirements of fast restoration of service, highway limitations and high capital investment in nonproductive transformer capacity pointed in the direction of a mobile transformer, the like of which had only been imagined. In exploring this possibility, an ideal spec was written covering the following points:

1. A self-contained mobile transformer as near 40 mva as possible without exceeding a 90,000-lb payload.
2. Tap voltages at 220/110/60 kv and on the tertiary to match all existing installations.
3. An over-all length, including tractor and trailer, not to exceed 60 ft; height not to exceed 13 ft, 6 in.; and width not to exceed 10 ft.
4. A complex weight distribution to give the most desirable axle loading for the weight.

In view of the fact that the largest mobile transformer previously in existence was 25 mva, Pacific Gas and Electric Co. approached transformer manufacturers on the basis of coming as near to the 40-mva figure as possible without varying from the other physical and electrical requirements. After serious study manufacturers agreed that such a unit could be built. Transformer suppliers made maximum use of aluminum in place of steel, specially selected core steel and used an absolute minimum volume of coolant in order to

stay within the weight and space limitations.

A local haulage firm undertook the design of the trailer. The trailer that resulted is covered by 15 patents by its designer, is the only trailer of its kind in the world and is able to turn on a 30- to 33-ft turning circle.

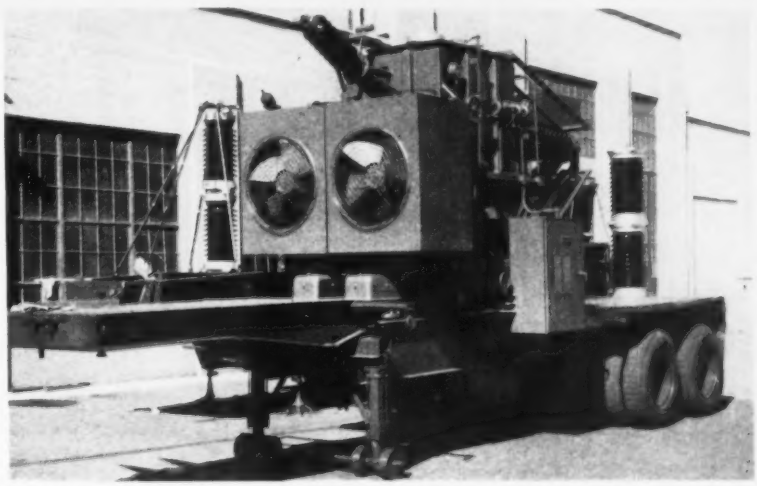
## Spares Put to Work

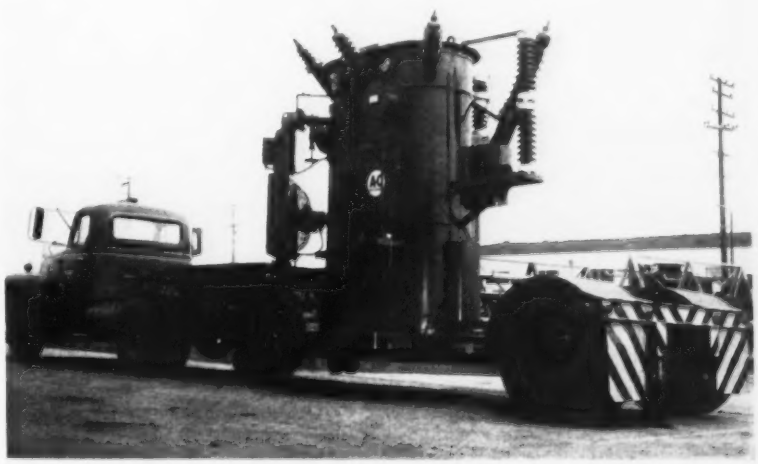
The availability of mobile units of this size makes it possible for PG and E to utilize the seven existing spare transformers in new banks that will be built during the next few years. The tremendous size of the PG and E service territory and the fact that the repair of a large transformer may require from four to six months made it advantageous for PG and E to order a second 40-mva unit. The value of the seven existing spare transformers much more than covered the costs of the new mobile equipments.

Studies indicate that the time required to restore service in the event of a transformer failure will be reduced 60%.

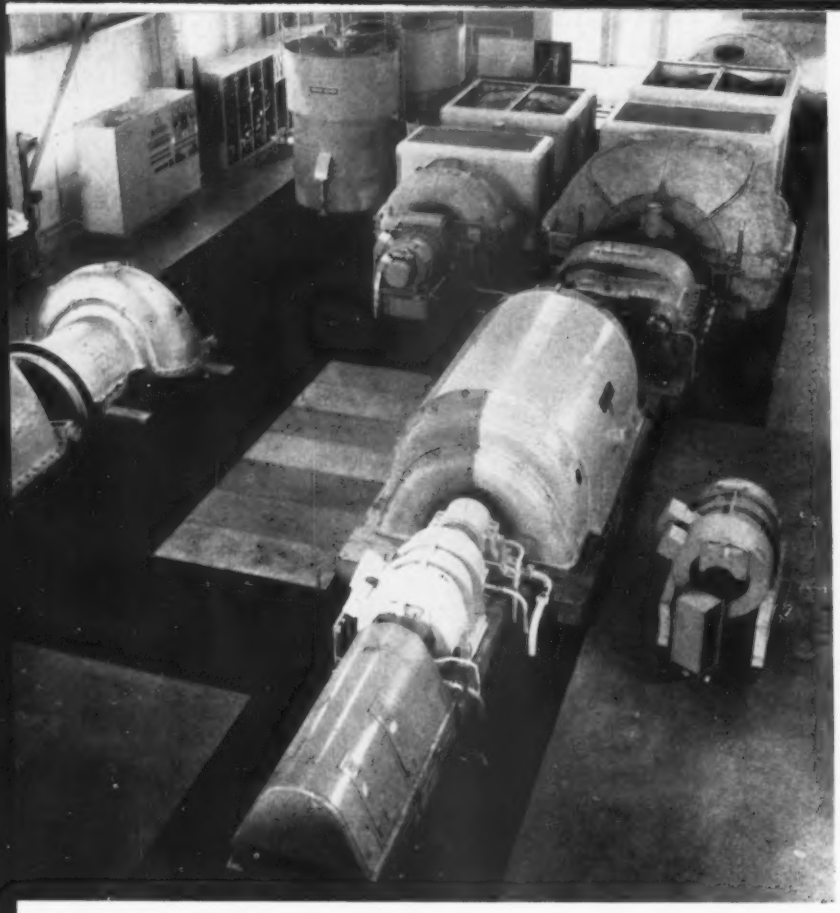
In addition to the 40-mva, 220-kv mobile unit, PG and E acquired a 20-mva, 110- to 60-kv mobile which will supply similar service and savings in the area of 110 to 60/12-kv substations. Still other 5,000-kva, 60/12/4-kv, single-phase mobile transformers will work on the smaller distribution substations of the system.

The purchase of the mobile transformers does not imply the purchase of a tractor since PG and E has contracted with a local drayage firm to supply the tractor and make arrangements for necessary hauling permits when moves are required.





**20,000-kva mobile transformer (above) will provide for 110/60-kv substations on the PG and E system. Below—5,000-kva, 60/12/4-kv mobile will free many spares in distribution substations for use in new banks, thus saving the price of new units**



Gas turbine room showing first completed 30,000-kw machine, parts for second machine shown at left

**Load pattern fuel costs, turbine characteristics all . . .**

# Favor Gas Turbines

**W. D. Kirkland**
Plant Superintendent
City of Edmonton Power, Water Supply & Purification Plant

The city of Edmonton, Canada, with a 1958 peak load of 145,000 kw, has installed 30,000 kw of gas turbine generation and is presently doubling this capacity. This high percentage of gas turbine generation makes sense in Edmonton because of a favorable fuel supply position and the fact that the Edmonton load is up during the time of the year when ambient temperatures are low and turbine efficiency is high. During the summer months, the gas turbines will be used for peaking purposes, at which time their quick start characteristics and absence of stand-by fuel costs make them particularly attractive from an operating point of view. An additional incentive is a gas rate structure which lowers the cost of gas per 1,000 Btu in the summer.

## Climatic Advantage

The efficiency in power output of gas turbines increases when the turbine inlet temperature is the highest and the ambient air temperature is the lowest. The accompanying curve shows the relationship between efficiency and ambient air temperature. The long range average temperatures at the Edmonton airport for the cooler months of the year are as follows:

| | |
|---|---|
| October | 41° |
| November | 24° |
| December | 13° |
| January | 6° |
| February | 11° |
| March | 23° |

A careful study of past and estimated future load duration curves and the heat rates of various units confirmed the conclusion that gas turbines could be economically and effectively integrated into the overall generating scheme by base loading in the winter time and peaking in the summer time.

## Conservative Temperature Limits

Even with rapid improvements in the field of metallurgy there are very finite limits to the ability of metals to withstand the stresses associated with high temperatures. Present American practice for gaseous fuels sets these limits between 1,400 F and 1,500 F. European practice is somewhat more conservative—between 1,100 F and 1,400 F. The Edmonton turbines are designed and controls are set for a maximum temperature at the turbine inlet of 1,150 F. While this temperature limit is a deterring factor in raising the efficiency of the cycle, it is felt that the conservative temperature limit will reduce maintenance of the combustion chambers to an absolute minimum.

The Edmonton machines, supplied by Brown-Boveri (Canada) Ltd., are of the two shaft, intercooled, reheat, open-cycle type. The schematic shows the main components. Air is delivered from above the roof of the building through a concrete duct to the low pressure compressor. After going through a water-cooled intercooler, the air goes to the high pressure compressor, which compresses it to the required pressure for admission to the high pressure combustion chamber. In the combustion chamber, approximately one-quarter of the air is used for combustion, with the remainder used for cooling the internal parts of the combustion chamber. The temperature of the resultant gas mixture, the turbine inlet temperature, is dependent upon the generator output, but in any case is limited to 1,150 F. The gas, having done work in the high pressure turbine, then passes to a low pressure combustion chamber (reheater), where the temperature is again raised before going through the low pressure turbine and then exhausted to the atmosphere.

## Fuel Supply

The Edmonton power plant has two separate sources of supply. One

source is the natural gas field at Kinsella, 70 miles east of Edmonton, and the other source is the stripping plants at the numerous oil fields surrounding the city, all within a 100-mile radius. For the year 1957, gas cost 13.18c per mcf at 957 Btu per cu ft—HHV. This cost was for the existing conventional steam plant with operating conditions of 400 psig and 750 F, which required 14.85 cu ft per kwh generated. In addition to the fact that the gas turbine capabilities corresponded favorably with the city load characteristics, there were other important factors contributing to the decision to install gas turbines. Of prime consideration was the fact that this important capacity could be obtained with less capital expenditure than for a conventional steam plant. These savings were not only in the equipment itself but in the auxiliaries—the building costs, including the crane, plant design and engineering.

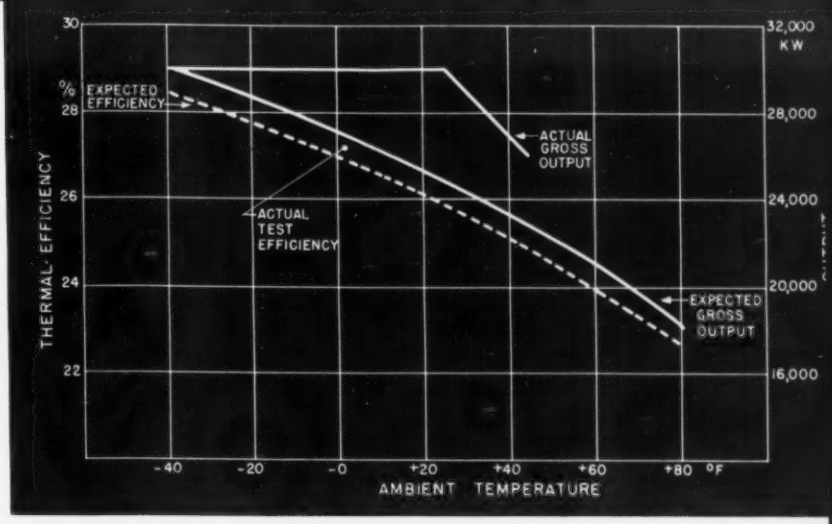
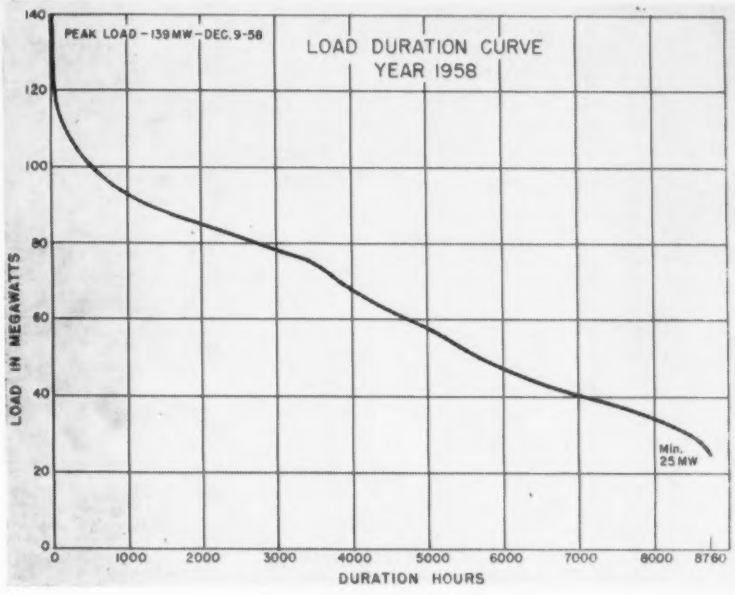



**Chart shows how efficiency and output increase with decreasing ambient temperatures. Below, load duration curve with peak in December when ambient is low, output high**




## Installed Costs

| | |
|---|---|
| Building, including crane | $ 9 |
| Turbine | 48 |
| Turbine stack, foundation and erection | 5 |
| Mechanical equipment | 6 |
| Electrical equipment | 7 |
| Engineering, etc. | 2 |
| | $77 |

In the case of the Edmonton plant, the installed cost of the gas turbine units was $77 per kw, while a comparable steam plant with the same capacity is estimated to be $85 per kw.

## Plant Operation

Operating and maintenance costs are estimated to be lower than for a conventional steam plant. The operating staff requirements for a gas turbine station are much lower than those for a steam plant. While it is possible for a gas turbine station to be operated automatically by remote control, the Edmonton plant requires an operating staff to be on hand during startup or shutdown. On stand-by, no staff is required, which is a big saving over the steam plant, where a boiler room staff has to be maintained so that steam is available to pick up peak loads. A gas turbine can be put on the line in 12 to 20 minutes from a cold start.

While there is annual maintenance anticipated in relationship to the combustion chambers where high temperatures are experienced, the relative freedom of the gas turbine cycle from auxiliary equipment is expected to place maintenance expense at a small fraction of that required for steam plants.

Cooling water requirements are much less stringent in the gas turbine cycle, where only a small quantity of water is required. This water requires only simple filtering rather than chemical treatments, as is the case for steam plants.

## Disadvantages

Gas turbines have an inherent disadvantage—they are noisy. Since the Edmonton plant is very close to residential areas, considerable attention was given to the problem of noise suppression. Particular attention was given to the high frequencies since they are more annoying to the human ear. The path of the incoming air takes two right-angle bends, to which a third was added by placing a concrete roof over the shaft. Within the shaft, a sound-insulating blanket consisting of glass wool panels, glass wool fabric and its expanded metal sheeting was applied at each bend. With this treatment, the noise emanating from the turbine throat, which reaches an intensity of 120 db, was reduced to an acceptable 65 db at the air inlet.

Mechanical and electrical engineering work was done by the engineering staff of the city of Edmonton power plant department with the assistance of the equipment supplier. The building design was done by consulting engineers Kasten, Longworth & Associates Ltd.

# Additions Require Teamwork

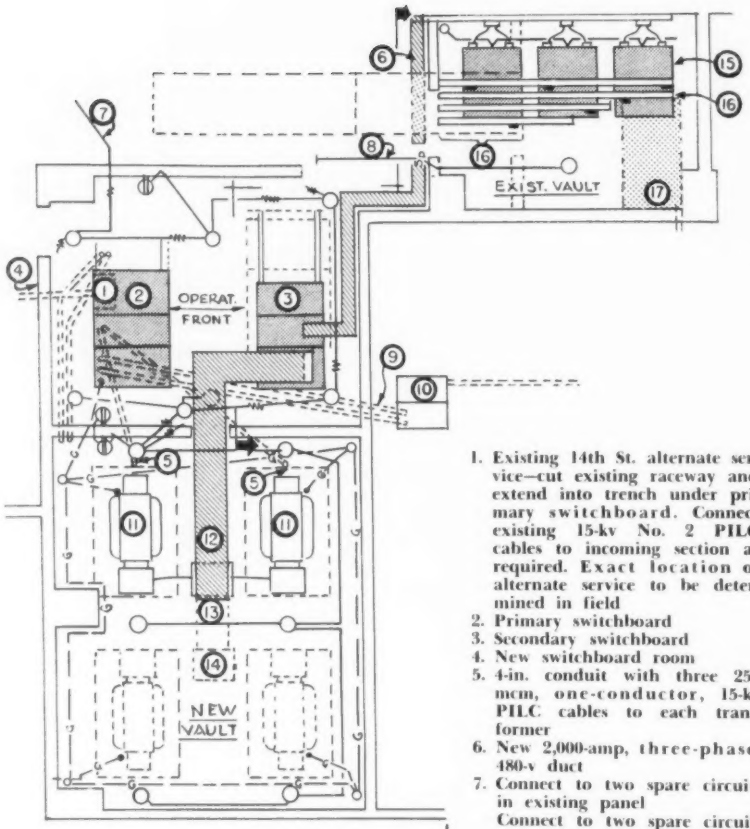
**Charles Krieger**
Consulting Engineer, San Francisco

Christmas shopping time at a Montgomery Ward mail order house is certainly no time to lose the electric service. This was only one of the problems faced as the initial phases of construction of a new addition got under way in Oakland last December. Careful scheduling of construction and coordination between Montgomery Ward, the architect, Pacific Gas and Electric Co., consultants, general contractor and subcontractors made it possible to do the job successfully.

Other things to worry about included (1) an anticipated Christmastime demand of 1,200 kva in the existing building, which was served by three 333-kva, 208-v wye PG and E transformers; (2) the 12-kv preferred primary service had to be removed so a loading dock could be extended; and (3) a leak had been detected in the alternate service so everything had to be done in a hurry. The preferred service came from 12th Street and the alternate from 14th Street.

Three stories of the new building rise above a double spur railroad track and the extended loading dock. The addition is 300 x 200 ft, and because of long feeders and branch circuits, plus a big fluorescent lighting load, a 277/480-v distribution system was designed. Both buildings were to be metered with a single PG and E meter at 277/480 v.

With existing demand of 1,200 kva and an expected demand of 500 kva for new building, plus allowance for a future demand of 1,000 kva for future four stories, existing vault was inadequate for total required transformer capacity. Therefore it was decided to provide a new vault to house a total of four 1,000-kva, three-phase PG and E units, two of which would be installed at this time, a new switchboard room to house a primary switchboard for selecting either the preferred or alternate feeder for serving 12-kv side of transformers and a secondary main switchboard for serving total project at 277/480 v wye, with a 2,000-amp bus-duct feeder to existing building transformer vault. Three new 500-kva, 480/120-v interteen transformers were to be installed to replace the existing PG and E units.




1. Existing 14th St. alternate service—cut existing raceway and extend into trench under primary switchboard. Connect existing 15-kv No. 2 PILC cables to incoming section as required. Exact location of alternate service to be determined in field
2. Primary switchboard
3. Secondary switchboard
4. New switchboard room
5. 4-in. conduit with three 250 mcm, one-conductor, 15-kv PILC cables to each transformer
6. New 2,000-amp, three-phase, 480-v duct
7. Connect to two spare circuits in existing panel
   Connect to two spare circuits in existing panel
8. Connect to existing circuit existing 208-v, main switchboard room
9. 2-4 in. conduit from pull box to primary switchboard. Extend existing coiled 15-kv cables from pull box in one 4-in. conduit to incoming section. Connect as required
10. Pull box
11. PG and E three-phase, 277/480-v transformers (1,000 kva each)
12. New 4,000-amp, three-phase, four-wire, 277/480-v service bus duct
13. Terminal busing for future extension. Provide end closure plate
14. Future bus extension and cable tap box
15. Three new 500-kva, one-phase, 480/120-v transformers
16. Remove existing bus duct enclosure for new transformers
17. Remove existing 15-kv feeder, cut 4-in. conduit flush with wall and seal both ends

Exceptionally close coordination, as mentioned before, was the key to the success of the project. Here is the step-by-step installation story.

1. The existing 1,000-kva bank was connected to the alternate 14th Street service, and the 12th Street feeder was removed so caissons for the loading dock extension could be poured.

2. While plans for the new 12th Street service were being prepared, the general contractor invited bids for three 250 mcm, 1/C, 15-kv PILC cables. This time-saving arrangement was used because a leak had been detected in the alternate service cables.

3. Bids were invited for installation of the new preferred service duct bank from the 12th Street service pull box to a new pull box outside the new vault. The bid included running a 4-in. conduit from the pull box into the existing vault. New service cables were purchased of sufficient length to reach the potheads in the primary switchboard, and coiled in the new pull box and leads extended into the existing vault through 4-in. conduit.

Over a weekend, PG and E replaced the three 333-kva transformers in the old vault with three 500-

kva units. The new 12th Street feeder was then reconnected to the larger transformers to provide the necessary capacity for the Christmas season. Existing oil switches were removed from the old vault and the alternate service was disconnected and cut back to the basement of the existing building.

4. In the meantime, the construction of the train shed area was proceeding and the primary switchgear and secondary switchboard were being designed and put out to bid to a selected group of manufacturers, along with the three 500-kva, 480/120-v transformers that would eventually replace the new PG and E units in the existing building. Also, the bids included the 4,000-amp service and 2,000-amp subfeed bus ducts. Bids for installation of the equipment were invited at the same time so work on the new transformer vault and main switchboard would not interfere with construction of the new loading dock.

The primary switchgear was installed and the alternate 14th Street service connected to it after being rerouted. Installation was completed, too, of the secondary switchboard, service bus duct and 2,000-amp subfeed to the existing transformer vault. The vault was enlarged at the same time. Over a weekend, the PG and E transformers were replaced with the three 500-kva, 480/120-v units that had just been purchased. The building was again in operation but with the load cut back to 1,000 kva because the alternate service was in use and it could handle only 1,000 kva. Immediately after this cutover the preferred service cables were extended from the new pull box and connected to the primary switchboard. Service was then switched back to the preferred feeder and load that had been disconnected was put back on the system.

5. Electrical work for the train shed area only was put out to bid because construction work was proceeding so rapidly.

Plans for electrical work on the first and second floors also had to be issued separately because of the rapid rate of construction. The plans were complete except for the feeder bus, duct riser, circuit breaker taps and floor distribution panel feeders.

6. The last portion of the job put out to bid consisted of the third- and fourth-floor complete plus bus duct riser and distribution systems for first and second floors.

All phases but No. 6 were installed by Pacific Electrical & Mechanical Co. Inc., the sixth by A. Neri of California Inc.

**Motors and Controls—III**

# Take Out Hot Spots

**Tom Hughes,** Electrical Safety Engineer, California Division of Industrial Safety

The electromagnetic fields produced in a polyphase rotating machine are quite complex and, of course, we can't consider them in this article. The average electrician realizes that the absence of back-emf (counter electromotive force) in the machine at standstill admits a current of from three to ten times the value of the normal running current 'til it approaches its running speed. The industry mentions this casually as the "inrush current" or more specifically as the "locked-rotor current."

But few persons have any conception of the complexities involved in the fundamental and harmonic rotating and counter-rotating fields affecting the torque of that particular design of machine at different points in its acceleration cycle. "Parasitic torques" and "subtransient reactances" are terms that TV quiz kids will not have to contend with, let alone the average electrical user.

However, anyone who made a passing grade in physics (regardless of how many years ago) knows that the tangible result of utilizing any form of energy is the production of heat. And any such casual student of physics or user of motors knows that the steady running current of a continuous-duty motor produces heat that must be dissipated. But what most users of motors are hazy about is that extra heat produced during acceleration.

It is popular in America to quip about the mentality of people in terms of "two and two making four." It seems to us that anyone who recognizes that the starting current of a motor may be five times the running current would be faced with the arithmetical realization that five times as much heat will be produced during starting. Yet, the normal electrician or contractor installs the same heat controlling or protective device for an intermittent-duty load as he does for a continuous-duty one.

In fact, it is not unusual to find the electrician or user of motors has difficulty delineating between intermittent and continuous-duty applications. How, then, can we expect the normal user of motors to realize that he must choose between several different types of motors with specially designed rotors if he has loads with divergent acceleration characteristics?

Not only does the average user fail to consider the nature of his loads in acceleration but he goes entirely by rule-of-thumb or a horsepower table in applying his motors to loads; regardless of the ambient temperatures he places them in or the means of heat exchange or dissipation provided.

Naturally, a motor placed in an attic or other dead-air space is not going to attain as safe a plateau of of heat dissipation as does a motor on the floor of a well-vented room, with a high ceiling. Tall machines, like pressbrakes, drop forges, and drop hammers, are normally found in large, high-ceiling factory quarters. Occasionally, though, someone moves such a machine into a low roofed structure where the motor (at the top of the machine) is up in a hot stratum of air near the hot roof.

The user will be quite mystified when it finally burns out; running up there in that high ambient temperature. For, he points out, it was just idling most of the time until someone tripped the clutch; and it had given no trouble over in its former high-bay work quarters.

Then there is the man who has a stockroom conveyor that is continually being started and stopped, all day. A little testing or experimenting shows that a 1-hp motor handles the load nicely but he can't see why it gets so hot and why it finally burned out. It wasn't even drawing its rated running current while the conveyor was running with normal load.

In this discussion of heat dissipation in motors we have assumed that the reader knows there is a direct relation between the temperature of a motor winding and its life span. A normal 40°-rise motor may give 20 years steady service at 120 F but the same motor may not last a year running at 200 F.

With the trend always toward smaller housings and less space for making connections, the ends of the coils must be bent around the sharp

edges of the laminations at the end of the slots in the stator core. Fish paper or sheets of other organic material are used to line the bottom of the coil slots; to protect the coils and provide additional dielectric.

Having used pieces of fish paper or varnished cambric to line crowded boxes or protect wires from abrasion, where they pass over the sharp edges of bus bars in switchboards, we know that such material will stand year after year with no altering of its texture. However, try cooking it (or any other organic material) in an oven for a few days and see how it drys out and changes structure (chars).

During the acceleration of a motor from standstill (and especially if it is starting a heavy load and takes more than normal time to come up to speed) the starting current heats the copper conductors up to a temperature far above their normal running temperature. The reader (not a motor designer) will say, "Well, why not use a little larger wire so it doesn't heat up?"

There are several answers to this and the first one that presents itself is that of conserving necessary volume to keep the motor compact and trim. But this is not the most important reason. To provide the most efficient performance in all respects, the inductive and magnetic circuits must be kept as short as possible. The air gap must be held to an absolute minimum and the conductors of stator and rotor brought as near to each other as possible (for, you see, making their interaction more difficult by moving them farther apart produces more heat from internal losses, also).

As an example: increasing the size of wire in the slots from No. 28 to No. 27 increases its diameter by 12% and that causes a considerable increase in the circumference of the rotor (if the lamination area between slots is to be maintained for proper magnetic path). The larger the rotor the greater the air gap between stator and rotor (to allow for expansion). Fifty years of intensive study and experimentation have fairly well established the perimeters of motor design and there is no room for chiselers in the game.

So we see that we must be prepared to accept some heating of the coils in the normal motor during starting cycle but an occasional start under light load can be absorbed. It is when we keep starting and stopping a motor, that was not intended for such duty, that we drive out all the moisture from our coil insulation and char it until finally we get a breakdown at one of those sharp ends of a coil slot and the motor has a "ground fault."

It must be apparent that the damaging heat is going to be produced within the stator coil slots. It must then flow endwise to the coil ends, where some of it will be transferred to the air currents produced by the rotor fan blades. A portion of the coil heat is transferred to the laminations and travels radially to the outer case of the motor. But you can see that there is a time interval before this heat finally raises the temperature of the outer case and the temperature of the outer case is no indication of the hot spots produced in the coil slots by frequent starting.

Of course, we can help the survival of a winding, which must operate in hot places, by insulating it with glass fibers, asbestos or silicone materials, but there is no such thing as an imperishable motor. There is the matter of vibration and stress in the coils that we haven't covered. The whole winding is stressed and vibrating under the 60-cycle fundamental alternations, plus the harmonics and subharmonics.

When you realize the existence of this steady vibration, you can see that whatever slot lining we use to separate the coil conductors from those sharp edges at the ends of the slots is going to take a continual hammering. Thus, the use of straight mineral or inorganic fibers as slot lining is no long term cure-all. They will separate and shift from where they are needed. The only answer is to bind them with an organic binder but then we are back to the life of an organic substance that depends on its moisture content for life.

We hope we have convinced you that there is only one answer to trouble-free motor life. That is to limit the production of hot spots within the winding.

### Chicago writes rules on

# Using Aluminum Conduit

Because of the intensive promotion of electric conduit systems of aluminum in the Western states some new regulations regarding the use of rigid aluminum conduit by the city of Chicago are of particular interest.

In its bi-monthly bulletin, the Bureau of Electrical Inspection of Chicago has this to say about it:

"Detailed study of comprehensive favorable reports on existing installations of rigid aluminum conduit, based on laboratory research and experimentation, experience through trial and error methods and field inspection reports, has resulted in the inclusion of rigid aluminum conduit by the chief electrical inspector as acceptable for use in the city of Chicago subject to the code provisions of Section 87-346 (rigid metal conduit) and the following precautionary limitations.

"1. Rigid aluminum conduit installed outdoors or in wet locations should be provided with aluminum fittings and supports.

"2. Rigid aluminum conduit installed outdoors and connected to absorptive structural material such as wood shall be provided with a moisture barrier or at least ¼-in. air space between the conduit and the absorptive material.

"3. Rigid aluminum conduit installed in wet locations shall comply with the provisions of Section 87-346.

"4. Rigid aluminum conduit shall not be located where washes or drainage from large area nickel or copper installations (such as roofings or copings) can spill onto the surface of the conduit. Extensive wash from metals highly cathodic to aluminum can cause severe corrosion.

"5. Rigid aluminum conduit installed indoors in dry locations may be provided with conventional fittings. Basements are included as 'dry' locations.

"6. Rigid aluminum conduit shall not be installed in concrete when reinforcing steel and calcium chloride admixture are part of the concrete or when any deleterious antifreezing agent is included.

"7. Rigid aluminum conduit shall not be inbedded in plaster when fast drying admixtures are included which have a deleterious effect on the conduit.

"8. Rigid aluminum conduit directly buried in soil shall have an inert organic coating applied to the conduit."

Illumination where required, plus decorative interest in the lobby, is found in the new Tidewater Building at Los Angeles

### Light and pattern come from

# Sawtooth Luminous Ceiling Design

A luminous ceiling need not always be a wide expanse of "sky." It can be worked in with the architectural design to contribute its share of an interesting pattern of ceiling decor. This is well exemplified in the lobby of the recently completed Tidewater Building at 4201 Wilshire Blvd., Los Angeles, pictured above.

The architect, Claud Beelman, used sections of luminous panel on both sides of the lobby ceiling, over the elevator entrances and to illuminate planter boxes. To give variety and interest, the ceiling is made up of what might be termed steps or a sawtooth contour. The side sections of luminous panel are made to conform and fit in to that scheme. The center section, as seen in the illustration, is made from panels of stainless steel. A series of round lighted coves breaks up the expanse and at the same time lights up the center of the lobby.

#### Aluminum Mural

The T-bars supporting the corrugated acrylic diffusing medium are of stainless steel also. At each side of the entrance is a large aluminum etched mural designed by Nilos Bel-Jon. These are beyond the luminous areas but are highlighted at night by colored PAR 150-w projector lamps that bring out the etching details. The walls are Italian marble and the floor is terrazzo. The elevator doors are black with gold trimming.

Air conditioning of the lobby is done through the Wakefield corrugated ceiling, using the space above the luminous areas as a plenum. Similar luminous ceilings are installed on the sixth floor for the conference and the directors' rooms, again using the plenum above them for the air distribution. The safety fire alarm system is likewise installed in the plenum above the corrugated plastic.

Electrical installation in the new Tidewater Building was made by Stetson Electric Co. W. A. McGuire of the Wakefield Co. assisted in developing the details of the special angular mounting for the acrylic plastic. Channels and fluorescent lamps were suspended from the slab above about 18 in. and a minimum of 15 in. to a maximum of about 24 in. from the plastic.

Simulated space rocket in test housing where conditions equipment will be subjected to are duplicated. There are 300 circuits at 480 v, each 33 kw, provided for heating in tests. All wire used is 900 F, high temperature wire

# Watch Rocket Tests With TV

**L. A. Schlagel**

Project Manager, Staff Research & Development Department
Thompson Products Inc., Englewood, Calif.

Explosion possibilities, toxic fumes and high temperatures require that viewing of a unique high temperature fuel system simulator be accomplished remotely. Closed circuit television equipment is being used for this purpose. The installation shown here is located at the staff research laboratory of Thompson Ramo Wooldridge Inc. at Inglewood, Calif.

The fuel system simulator is designed so that duplication of complete integrated flights can be accomplished on the ground. All of the environmental conditions that the fuel system will be subjected to in high performance aircraft flight are duplicated:

- Aerodynamic heating
- Altitude
- Attitude
- Oscillation
- Vibration

The only important environment that is not simulated is that of acceleration loads. All of the parameters which are simulated are coordinated into an integrated flight schedule. This schedule includes ground refueling, taxiing, take-off, climb to altitude, high-speed runs, acrobatic maneuvers, let-down from altitude and landing. As the test program progresses, only those portions of the flight profile that are of particular interest are simulated.

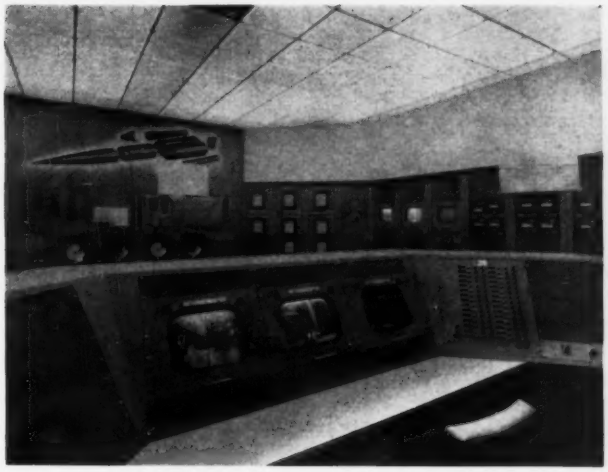
**Editor's Note—All engineering and design for the test facility was done by Thompson Products staff. Actual electrical installation was made by F. W. Riley & Son, electrical contractor. Intercommunication systems were installed by Hannon Engineering Co. Dage TV closed circuit system was furnished by Monson Electric Co.**

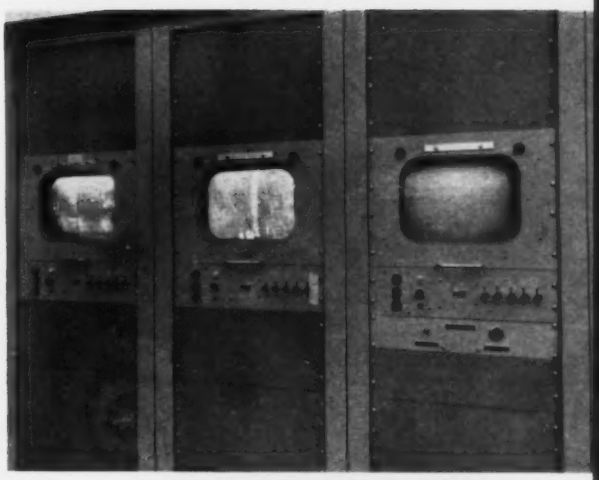
The entire room housing the simulator is designed to be inerted with $CO_2$ during testing. This gas is introduced until the oxygen concentration drops below 10%. At this oxygen concentration, no fire can occur if the fuel leaks or is spilled on the 1,800° heating elements. With some of the more advanced fuels, it is anticipated that the oxygen concentration will necessarily have to be reduced below 2%.

Since insufficient oxygen remains in the room to breathe, any viewing of the simulator must be accomplished remotely. For the purpose, the Dage closed circuit television system was installed. One of the camera installations is shown. Direct viewing windows were considered to be unsafe, the reason being that if a tank should suddenly rupture the resulting pressure created by the hot fuel vaporizing would be hazardous to anyone in the immediate vicinity. Therefore, it was decided that all personnel would be removed from the immediate test area and housed in a reinforced concrete building some distance away.

Because of the high ambient temperatures encountered, it was necessary to mount the television cameras in a protective housing. This housing is cooled with gaseous $CO_2$. The flow rate is adjusted so that the temperature inside the case stays below the prescribed maximum. These cases also provided an explosion-proof housing, required so that remote viewing of the pit is possible during the preparation of the simulator for test.

Fuel vapors may be present in the pit because of the fueling of the test rig. Therefore, when personnel are





present, all equipment in operation must be explosionproof.

Thermal protection of the control and transmission cables for the television equipment was found to be necessary. Radiation from the vicinity of the simulator was sufficiently severe to char the cables on one side. Protection of the cables was accomplished by wrapping them in aluminum foil.

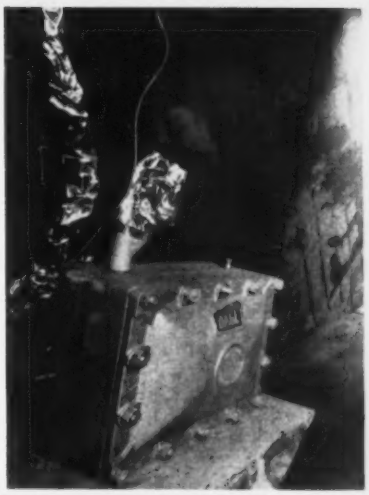
Control of the TV camera is accomplished from the remote station in the control room. At this station, each of the three cameras can be positioned in both pan and tilt. Selection of any one of four lenses can be made. Optical focusing can be done remotely as well.

Television monitors are provided the test personnel at strategic locations. The director of the test program has three monitors mounted at the master control console. This provides at his station one monitor for each of the cameras.

It is felt that the direct viewing of the simulator during test is quite useful during the course of a test run. In addition, this equipment is a valuable adjunct to the fire detection and safety system. This valuable feature was demonstrated early in the first test program. A fire was noticed on the television monitor before any of the other warning systems was activated. This enabled the test director to energize the fire fighting system very rapidly. Prompt action resulted in the extinguishing of the fire before extensive damage occurred.

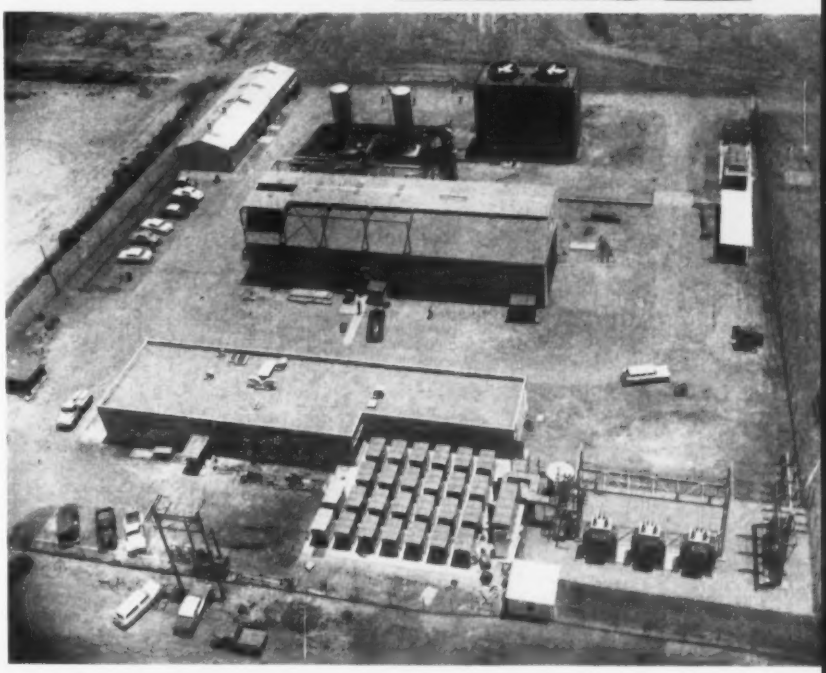
Because of its proved value, television viewing of the simulator is being planned for all subsequent test programs. It is felt that the benefits gained from direct viewing, from both a test and safety standpoint, justify the cost.

**In a separate and remote concrete building, the instruments and controls are located. A central control room has instruments to record test data and television monitors, both in the test panel section and at the main control console desk, one for each of three cameras, used to watch tests from a safe distance simultaneously**



**TV camera in explosionproof case, aimed down into test well. Aluminum foil protects conductors from radiant heat**

**Air view of staff research laboratory of Thompson Ramo Wooldridge Inc., Inglewood. Note heavy electrical facilities: power from Southern California Edison at 66 kv, to 11,700-v transformers. Connected load, 15,000 kva; capacity, 100,000 kva**



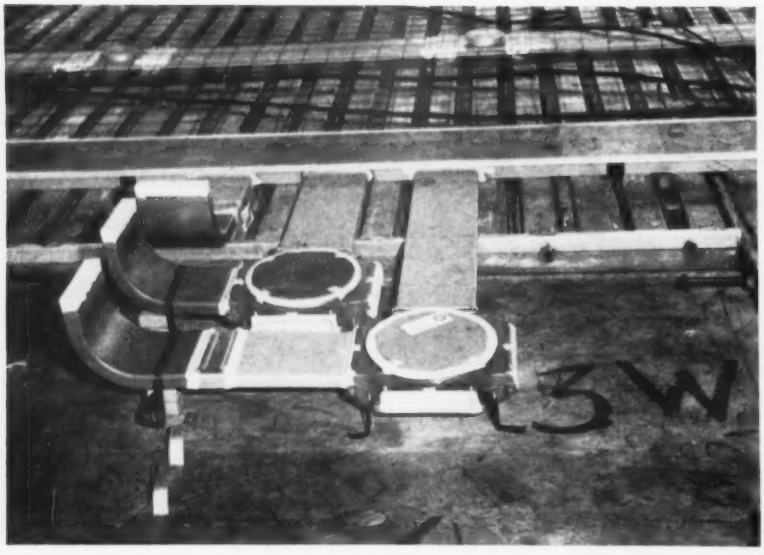
**Top—Diamond core drilling through slab to cells for placing of inserts. Bottom left—Special duct placed on cellular steel decking, with header panel fittings. Regular headed duct beyond. Bottom right—Superintendent Larry Hultgren with a section of duct and cover**

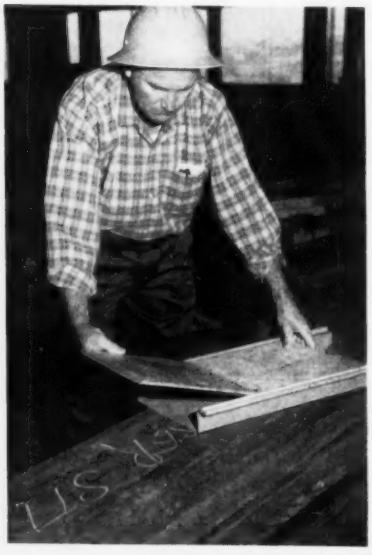
# Aluminum Duct for Kaiser

IN anticipation of a complex and extensive telephone and intercommunication system, as well as a great need for office machine power in its new 28-story building, the Kaiser Center in Oakland instituted a new aluminum header duct. It is used to interconnect the channels in the cellular steel floor decking, which will be used as raceways for the circuit wires.

While a standard 10-in. steel header duct is used for the power circuits, the custom-made aluminum duct for the telephone headers was created for this big job by National Electrical Products. It consists of a channel, 12 in. wide, flanged to hold an extruded aluminum cover flange that will be flush with the floor. To cover the header duct, square plates of heavy cast aluminum are laid in the channel and fastened by small screws.

Because the building is shaped in a gradual curve, lengths of the duct are made to conform by joining them at a small angle. Special fittings to go from the duct to panels above the finished floor were made up too. So successful has this custom-made duct been in this job that National has added it to its line. Foothill Electric Co., electrical contractor for the Kaiser Center, found it easy and fast to install and it gives ample access to the circuiting, both for the original installation and for future changes.



# ELECTRICAL WEST
## Construction News

**For**
- contractors
- consulting engineers
- lighting engineers
- wiring designers
- distributor salesmen
- all interested

New managers were announced and introduced at the California-Nevada Conference of NECA Chapters at Berkeley March 20. W. A. Quinley is the new secretary-manager of the East Central California Chapter in Fresno. In San Diego Chapter, E. Lad Sabo becomes the new chapter manager when Shelby Wiggins retires in mid-April. . . It was also reported that Joe Bollinger, field representative for District 8, out of Salt Lake City, and acting manager of the Mountain States Line Constructors Chapter, had resigned to return to San Diego with Ets-Hokin & Galvan Co. . . . H. E. DeVilliers, manager of the Southern Nevada Chapter at Las Vegas, was likewise said to have resigned to accept a national field representative post in Texas.

Quinley Appling

Another chapter, Sacramento Valley, recently elected young Kenneth Carlson of Grason Electric Co. as its president; Robert Jewell of Merwin Electric Co. vice-president; L. C. Wesleder, Adams Electric Shop, Auburn, secretary; and Rex Moore Jr., treasurer. Hugo Becker, Wisner & Becker, was re-elected governor. J. D. O'Connor, District 9 vice-president, is also from that chapter. Joe Krivanek is manager. The chapter plans a new building soon, on Elvas Boulevard. It will also provide space in its 48,000 sq ft for the plumbers association, kitchen and office facilities for the benefit and health and welfare programs.

Nevada's electrical industry, remote as it may sometimes feel, was afforded a "straight from the horse's mouth" preview of what the 1959 National Electrical Code will be from Frank Stetka, NFPA field engineer. He had just spent two months editing the preprint edition (available at $1.50 from NFPA). Stetka was joined by Karl Geiges, UL vice-president and Code Panel 15 chairman; Chester Hefner, Southwestern Section president, International Association of Electrical Inspectors, and Lou La Fehr, its secretary, and Harold S. Morr, Utah Fire Rating Bureau, IAEI past president, to make up the top rank program. Occasion was the ninth annual meeting of the Nevada Chapter, IAEI, at Winnemucca, April 18.

Sabo Ferguson

Reno was selected for the next annual meeting—jointly with the Southwestern Section annual conference scheduled there in September of 1960. So Reno electrical inspector Ralph Bisset was elected Nevada Chapter chairman; Lynn Steiner of Ely, where the 1960 meeting will go, vice-chairman; John Smales, Elka, secretary. The chapter shows commendable growth, appropriate to booming Nevada.

Carlson Krivanek Becker

A wiring allowance of $25 for each electric water heater installed in new construction or for the first installation in an existing structure was recently authorized by the Salt River Power District in Arizona.

Contractors and union should do more than belittle recent articles in national magazines critical of the increasing costs of labor in construction. These are "danger ahead" warnings from the public that should be heeded rather

than protested or squelched. Architectural Forum calls the clubbiness of NECA and IBEW to question. Even if legal, it causes the third party—the public—to pay premium wages and fringes as these are heaped higher. Better Homes and Gardens deplores the "goof-off" in home building labor and prints a labor leader's own criticism of the costly "coffee break." It can add from $500 to $1,000 to the cost of a house.

**Credit available**

Joining the banks, Universal C. I. T. Credit Corp., until now chiefly in auto finance, now offers credit for home-owners' property improvements.

Electric heat has made it! When the National Association of Plumbing Contractors decided that electric heating has arrived and urges its members to get into the business of selling and installing it to offset losses of other forms of heat, it is high time the electrical contractors get in first with the most.

**Show on the road**

The 1959 Road Show on commercial and industrial lighting by the Northern California Electrical Bureau has gone on the road. A continuation of last year's promotion which reached 2,500 store owners, architects, engineers, this year's itinerary covers the northern part of California and started in Auburn March 31 for 10 consecutive weeks. Three days each in the following cities are planned: Marysville, Chico, Red Bluff, Eureka, Santa Rosa, Vallejo, Berkeley, San Rafael and San Francisco . . . More residential lighting sales classes are scheduled likewise beginning in April in Monterey, San Luis Obispo, Fresno and Bakersfield.

A needed service has been instituted by Dan B. Leech of Beverly Hills Fan Service who offers "factory fresh" cleaning of electric fans used in kitchens, bathrooms, laundry and conference rooms. Leech was formerly sales manager for Smallcomb Electric Co. before organizing his own fan service.

**Stops sound, not fire**

Low-density combustible fiberboard used for sound deadening is providing many headaches for electrical fixtures makers and contractors. The next edition of the National Electrical Code will require space between such materials and fixtures, space the architects are unwilling to give but that inspectors will demand. In setting up standards for testing of fixtures to comply, Underwriters' Laboratories has made them realistic and so severe. Manufacturers claim they are impossible. The argument was itself heated at recent inspector meetings (typically, the Sacramento Valley Chapter, IAEI, and the Northern California Chapter). It is an expensive problem.

To meet the new code requirement of spacing from low-density, combustible fiberboard All-Brite has brought forth two solutions. One is a new spacer for mounting fluorescent luminaires the required distance from the combustible material. The other is a new design of fixture mounting which should provide more circulation of air and the required spacing.

**Most medallions**

The West accounted for the highest percentage of Medallion Homes with a total of 14,000 Bronze Medallion Awards and 1,525 Gold Medallions in 1958, according to Frank Falge of the Live Better--Electrically program. Of this total the Southern California Edison Co. territory accounted for the largest number, 11,000.

A big circus tent on the Edison parking lot housed the first Covina fair, open to the public after an invitational first-night showing

**Showmanship packs them in and sells them at**

# Edison Heat Pump Fairs

FAR from resisting the advance of electric heat, as is sometimes charged, Western utilities are doing much to encourage it as a load builder and an essential part of electric living. One example of the kind of promotional job being done is the current heat pump program of Southern California Edison Co., which is stepping up sales dramatically. During the first two months of this year, 265 residential units were added to Edison lines, as contrasted with 639 during all of 1958. In addition, there were 415 industrial units, representing about 2,000 hp, sold in January and February alone.

According to Harold Moore, general sales manager, this modern weather machine, which is proving an excellent year 'round load builder, is also fast winning public favor both in the residential and commercial fields. In Gold Medallion Homes on display around the system, the heat pump is one of the most popular features, he says.

In fact, it was the many questions asked by model home visitors that prompted Edison to set up special heat pump demonstrations near its electric living centers. While these question and answer sessions are open to all Edison customers, special invitations are sent to architects, engineers, builders and other industry allies. Prospects—and there have been a lot of them—are turned over to dealers.

Of several types of promotion put on around the company system, one of the most novel was the Heat Pump Fair, held in a circus tent with plenty of room for large crowds to hear the sales pitch and inspect manufacturers' displays. The first one at Covina was developed by Robert Brossard, district sales manager, and Robert L. White, eastern division area power engineer. Four thousand invitations were sent out to Edison customers and the big top was set up in the parking lot area of the Covina district office. Fifteen manufacturers were represented and each dealer reported not less than four sales as a direct result of the activity.

A different type of program, the Weatherama spectacular held at the San Gabriel Civic Auditorium March 5, drew 1,500 members of the construction industry. Here the show included talks and demonstrations on the use of heat pumps, an analysis of their impact on commercial and residential building, cost studies and testimonials from satisfied customers. After the show, which was staged as a spectacular, guests were directed to a tent in the adjacent parking lot to see the displays.

Eighteen manufacturers are now cooperating with Edison on this program. They furnish the displays—ranging from small, room size to commercial units—and send representatives to answer questions about installation and operation. Edison provides the space, tent, publicity and advertising and coordinates the shows. It also staffs them with its own specialists.

Since maintenance is vital to commercial sales, Edison conducts a service school for its own people, teaching them "what to do until the doctor comes."

Moore says the company is well pleased with the program, which has had full cooperation of manufacturers and distributors and is considered a powerful weapon against competition. That sales are more than satisfactory is evident from the comment of one participating manufacturer who was "surprised at the number of buyers or bona fide prospects" resulting from the shows.

R. L. White of Edison, left, explains operation of an air conditioning unit

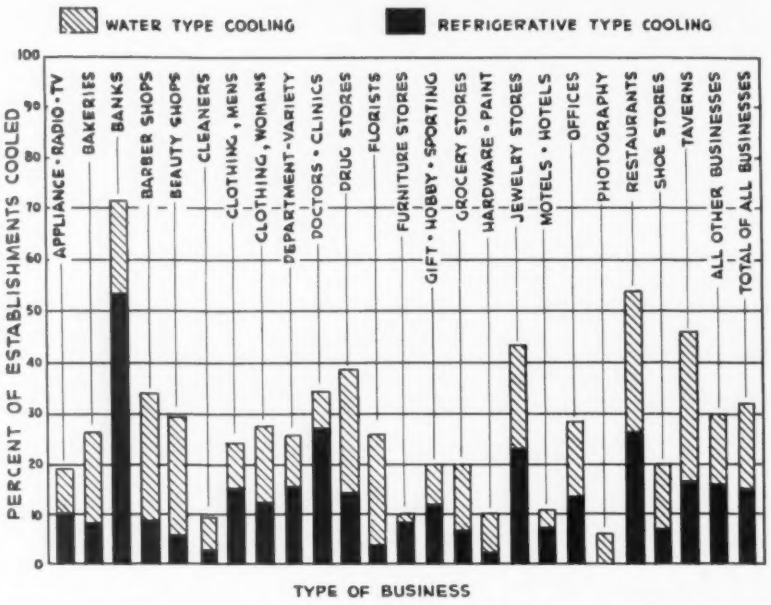
**Utility makes survey of commercial accounts to get ready for a . . .**

# Sales Drive Based on Facts

BECAUSE it wanted facts on which to base its air conditioning promotion, Portland General Electric Co. went where they could be found —to the stores, restaurants, offices and other business establishments on its system. The result was a wealth of data on who has cooling equipment, who wants it, who doesn't want it and why.

This survey of commercial accounts was made during the summer of 1958 by two college men, Dan McLellan and Charles W. Shirley, under the direction of PGE's commercial sales force. Where PGE is the only power company serving the area, a door-to-door canvass was made. Elsewhere, the company mailing list was used to select establishments. The survey was restricted to the street level, leaving out large office buildings, mainly located in downtown Portland.

According to Bob Seaberg, commercial sales engineer for the utility, approximately one-third of the 1,732 commercial accounts surveyed have some type of cooling system, with the percentage about evenly divided between water type and the better refrigerative-type units.




**This chart shows percentage of refrigerative and water cooling systems installed in various types of commercial establishments on the Portland General Electric system as a whole**

Comments of businessmen, carefully noted and incorporated into the final report, indicate a growing interest in air conditioning, with prospects for new installations and of expansion and improvement of present systems. In addition to their value in preparing the sales story, the calls made on these customers stimulated sales, the utility believes.

Need for air conditioning in the area was pointed up by the survey, as was the lack of knowledge concerning types of equipment, their operation and benefits. In communities where local dealers had actively promoted air conditioning sales, percentage of refrigerative units was proportionately high.

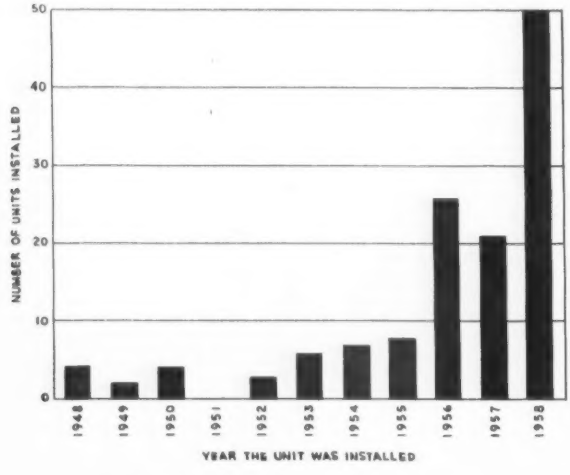
In downtown Portland, where business volume, working capital, competition and employee turnover are all relatively high, was found the largest percentage of all types of cooling. Surveyors commented that air conditioning is becoming a necessity in this area to stimulate business and compete with new suburban shopping centers.

Concentration of air conditioning is definitely determined by the type of business, it was learned, with banks, restaurants, taverns, jewelry stores, drug stores and doctors' offices in the lead.

Growing acceptance of air conditioning was shown in the large number of businessmen who do not now have this equipment but reported definite plans to install it before the summer of 1959. Many of those having water-cooling systems stated that they would like to have refrigerative-type equipment.

Customers who said they would like air conditioning but do not intend to install it gave equipment cost as their principle reason. Offsetting this comment were the many businessmen using air conditioning who commented that increased sales after installation more than paid for the unit.

Another reason given for not installing air conditioning was building ownership and lease problems. Businessmen did not want to face having to sell units or move them

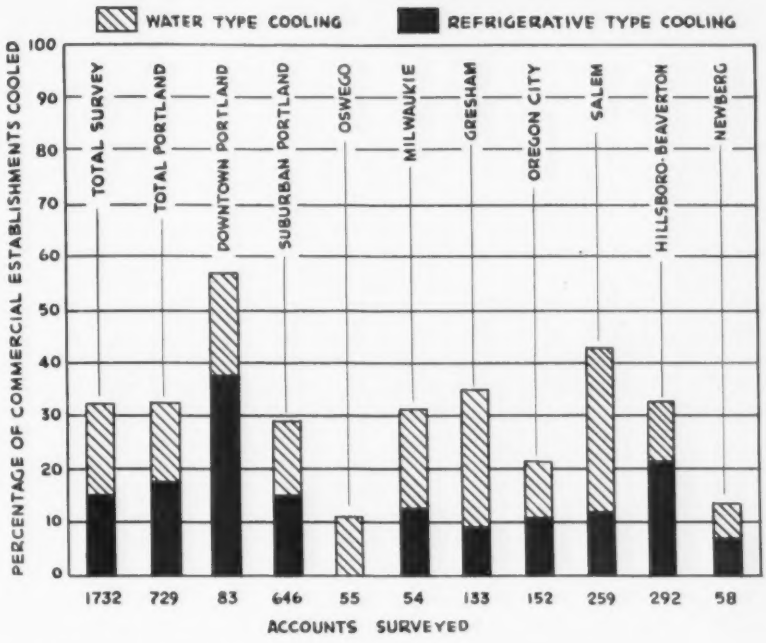



**Refrigerative-Type Equipment**

**Growing popularity of refrigerative-type air conditioning is shown in the chart at left. While it presents only a rough estimate of the true relation numerically of units installed each year during the 10-year period, it does show the general upward trend. Approximately 38% of installed units were put in in 1958 —an increase of 238% over 1957 and 192% over 1956. Installations before 1956 constitute only 26% of the existing refrigeration-type units**

## Air Conditioning by Area

**Chart shows results in PGE divisions as compared with the over-all survey finding of 32.1% of commercial establishments with cooling, divided 15.1% refrigeration and 17.0 water-type units. Surveyors commented that in downtown Portland air conditioning is becoming a necessity to stimulate business and compete with new suburban shopping centers. In Hillsboro-Beaverton, active dealer promotion was seen as one reason for the high percentage of refrigeration-type air conditioners (all 63 units were in downtown sections); another was to prevent loss of trade to Portland. Lack of equipment in Oswego was laid to cooling breeze from Lake Oswego on one side and the Willamette River on the other. A new bank with a large heat pump will be the city's first refrigeration-type unit. Although Salem was high among the divisions in percentage of cooling installed, percentage of refrigerative units is low as compared to other cities surveyed. Lack of promotion was evident here, since belief that water-type systems are as efficient as refrigerative types was 81 to 31**




to a new location. Many said they had tried without success to make satisfactory arrangements with building owners. In many cases landlords wanted to have a very short write-off period financed by increased rent, they reported, while others completely rejected the idea.

Other reasons: that stores stayed cool, people objected to noise, breeze generated, shock of walking from an air-conditioned room to the hot street; health problems; and fact that the business was going to close or move within a few years.

While the explanation that their surroundings were "cool enough" was considered more of an excuse than a bona fide reason for not installing equipment, it was given in a number of instances; was a prime one with doctors and operators of beauty and barber shops. A look at the four month record (June-September 1958) shows that on 79 days the thermometer went above 75° in the Portland area. Sixty of them were in the 80-90 and over range.

Findings in different types of business establishments should be a help to salesmen in preparing their prospect lists. Jewelry stores, for instance, were found to be one of the best prospects for air conditioning because of their normally small area and the large lighting load required for merchandise display. Fifteen jewelry store owners said they would like air conditioning and five are planning to install refrigeration units, one a water-cooling system.

In restaurants, 25% of the water coolers were found to be the small portable "swamp" variety, none of them satisfactory. Florists felt generally that the dampness produced by the water units was more beneficial to their flowers than the dehumidifying action of the refrigerative units.

Whatever the sales resistance may be, however, PGE salesmen and their allies are well armed with facts about their customers and their equipment.

## Electric Bed Covering at San Diego

WHILE 30% of a 300-home sampling in the San Diego area use electric bed covering only 5% bought wholesale or at a discount house. The survey was made in 10 areas for San Diego Gas & Electric Co. by Southwest Surveys.

Forty-four per cent of the homeowners interviewed had had some experience with electric bed covering; 27% were now using it personally; 3% said other family members were using it; and 14% had discontinued its use.

Age was a determining factor, with use increasing in each age group. While young women were more frequent users than young men, older men seemed to use electric blankets a little more often than older women.

Thirty-two per cent of those who used electric bed covering received it as a gift; 47% bought it at department stores and 9% at appliance stores. The rest bought at other types of stores or did not remember.

Decorative color influenced only 21% of those buying. Light weight had the greatest appeal, with 58% mentioning it as the greatest single benefit. Twenty per cent listed pleasure of getting into a warm bed as the greatest benefit but 30% gave this feature as the second benefit.

Main reason for discontinuing use was the warmth of San Diego's climate. Of those who had had no experience with the blankets, 28% said they just hadn't thought of it; 19% said it was too expensive; others thought the climate was too warm. Both groups put fear of fire and shock and cost of operation way down the line. Eight per cent of the discontinuing group cited repair problems.

Seventy-six per cent of the sample have electric heating pads and 96% of them are satisfied.

Seventy-seven per cent of the respondents do not know how much it costs to operate the device. Fourteen per cent of those who use it estimate the cost to be one or two cents per night or less. Fact that electric bed covering is washable was known by 53%, though some do not consider anything washable that cannot be thrown into the automatic washer and allowed to remain through all the cycles.

Left, W. L. Chadwick, Edison, and R. L. Brinton, PG and E, general program chairman, chat following Chadwick's keynote address. Right, Bill Poynter, FPE, and Willard Nott, Sangamo

**PCEA engineers, accountants meet in Long Beach to . . .**

# Tackle Tomorrow's Problems Today

PCEA President Leslie Hicks, retiring president of Hawaiian Electric Co., commented favorably on the Engineering and Operating personnel's vigorous approach to the challenge of "Let's Tackle Our Problems Now." He traced the growth of the power industry from his own early days to the present, and paid sincere tribute to the technical people who have made possible today's electric power industry. A special tribute, he said, should be paid to Bob Brinton of Pacific Gas and Electric Co., and to George Best of General Electric Co., whose direction had made the Long Beach meeting so successful.

## Challenges Ahead

With the theme of tackling problems, it made real sense to have W. L. Chadwick, vice-president, Southern California Edison Co., address the group on the many challenges ahead. Some of the challenges:

MANPOWER—The job has just begun. Competition for the best technical minds will increase. Our job is to continue to sell from the high school through college.

BROADER INTEREST—The need for engineers to view the whole of the utility operation is crying. Some progress has been made, but more cross training will benefit the industry as well as the individual.

COST CONTROL—Our country's dominant position in apparatus design and manufacture hinges on our ability to increase productivity and reduce costs.

SERVICE RELIABILITY—Electrical living carries with it a concomitant requirement for more reliable power.

UNDERGROUND DISTRIBUTION—Much too little research on the over-all design of underground system at a cost that might make underground attractive for the user.

AUTOMATIC OPERATION—Full use of the potentialities of today's computers should be utilized in the start-up and economic operation of a power station.

METALLURGY—Real advances have been made in vacuum casting of large forgings. The gain in heat rate is being more than offset by the increased costs of super temperature and pressure turbines—indicating a problem that must be solved.

AIR POLLUTION—Air pollution represents a problem, both technical and social in its scope, and one with unlimited opportunities for the engineer and scientist.

EXTRA-HIGH VOLTAGE—The economics of interconnection, coupled with the fact that generating plants may one day have to be located remote from the load center, create a pressing need for ever higher transmission voltages.

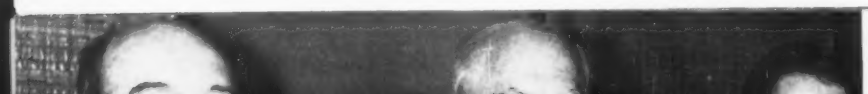
ATOMIC ENERGY—The challenge in the fields of nuclear fission and fusion offers a lifetime of opportunity to thousands of engineers and scientists.

Chadwick cited fear of innovation as the enemy of a dynamic engineering organization. He quoted Charles Kettering as saying, "The price of progress is trouble."

## General Sessions Digital Computers

*Sponsor: C. B. Bennett, Fluor Corp.*

Edward Longacre, Arizona Public Service Co., in discussing his company's use of digital computers, pointed out that the phenomenal growth of electric companies since the end of World War II, coupled with their complex interconnection and pooling arrangements, has created tremendous quantities of data requiring analysis and processing. The Univac has proved to be a most satisfactory tool for readily processing mass data.



**Danielson**
Okonite

**Bennett**
Fluor

**Caraco**
Bechtel

**Breckenridge**
Ebasco

**McKenzie**
Edison

**Churchill**
L-M

**Llewellyn**
Arizona PS

W. M. Pickslay Jr., Pacific Gas and Electric Co., recognized the tremendous future possibilities of computers in the IBM 700 series, but pointed to the value of cooperative programming and urged that all utilities take part in cooperative efforts insofar as practical so that the greatest benefits from computer usage may accrue.

Westinghouse Electric Co.'s David Reps pointed to three areas where the computer is making contributions in the field of distribution. The first area is in the solution of every-day problems—the solution of problems involving voltage drops, line losses and location of equipment. The second area is in system planning and function, wherein computers are giving solutions to long-range problems involving subtransmission, primary-feeder voltage choice and other problems too complex to be reduced to simple formulas. The final area where computers are of considerable value is in enabling the distribution engineer to understand the nature of the loads he is serving.

The final speaker in the Digital Computer session was Thomas Hudson, Daystrom Systems Inc., who discussed the requirements of computers for automatic operation of steam-electric power plants.

## Transmission & Distribution Line Construction Methods

*Sponsors: P. K. Churchill, Line Material Industries, and N. J. McKenzie, Southern California Edison Co.*

O. N. Kulberg and F. R. Payne of Southern California Edison Co. gave a special report on Edison's use of helicopters in line construction. This was followed by a presentation of L. A. Smith, Southern California Edison, and R. L. Franklin, Arizona Public Service, in which slides of labor-saving equipment and practices from all PCEA companies were presented to the group.

## System Operations

*Sponsor: M. R. Llewellyn, Arizona Public Service Co.*

Three manufacturers' representatives, J. B. Tice, General Electric Co., N. E. Brown, Leeds & Northrup Co., and E. W. DuBois, Westinghouse Electric Corp., discussed the savings resulting from economic load dispatching. They concluded that savings due to various automatic dispatching methods are substantial, but that they are simply an additional tool which enables system operators to do a better job.

Addressing the group on accomplishment of dispatch functions, C. F. Frye, Southern California Edison Co., pinpointed selection and training of personnel as of extreme importance. Because of the many responsibilities that a dispatcher assumes in operating the system, it was suggested that dispatching should prove to be an ideal training spot for men who will move on to larger responsibilities within the company.

Arizona Public Service's F. M. Irish and Southern California Edison's R. W. Mort covered the subject of collection and utilization of weather information. Irish discussed the various sources of weather information that his company utilizes, and then explained how the information was used within the company to prepare for any possible harmful effects of weather on the power system.

**C. K. Lewis, Allis Chalmers, George Best, G-E, 1960 general program chairman, and Vic Hartley discuss next year's program**

## Substations

*Sponsor: R. F. Stuart, Pacific Gas and Electric Co.*

H. J. Erling, PG and E, opened the Substation session with a discussion of air break switching for transmission lines and substations. He indicated that in recent years a rapid development in interrupters has created the opportunity to expand the use of this type of equipment with little or no loss of operating advantage, and with a considerable opportunity to reduce costs in substation design.

Treating the subject of mobile transformers and substations, C. D. Mack, San Diego Gas & Electric, and J. L. Buckley, PG and E, reported on the use and economics of this equipment. Mack showed how the change from three single-phase units with a spare per substation to a single three-phase substation transformer brought about the mobile substation on his system. Using the mobile subs for emergencies, maintenance, operational changes and construction work, San Diego G&E has found the equipment to be extremely valuable. Mack said, "For over 12 years, the San Diego Gas & Electric Co. has so successfully coordinated the use of mobile substations that approximately 70% of the service from this equipment has helped reduce the cost of new construction." Buckley discussed the reasoning behind his company's purchase of a 40,000-kva mobile transformer (see the story on this subject, p 70).

**Oldendorf**
Calectric

**Hicks**
Heco

**Patterson**
Convair

On the subject of substation maintenance programs, practices and costs, O. L. Renfro, Southern California Edison, and F. J. Sandrock, PG and E, pointed out that a proper maintenance program is perhaps the best means of providing uninterrupted service. The key to a good maintenance program, they pointed out, is the development of an economical and practical procedural system, implemented by proper tools and well-trained personnel. They said that aside from the purely operational aspects, appearance and landscaping were becoming an important public relations requirement in substation maintenance.

Westinghouse Electric Corp.'s A. J. Maslin and C. B. Faubion of General Electric discussed recent developments in gas-filled power transformers. They pointed to the long-term desirability of getting away from oil as an insulation and cooling medium, and indicated that size and voltage rating of gas-filled equipment would increase, but that a favorable evaluation of the advantage of gas over oil would be required since the gas-filled transformer in the near future would be more costly than its oil-cooled counterpart.

The second day's program began with N. E. Dillow, General Electric Co., discussing the various approaches and considerable success his company was having in producing low noise level power transformers.

W. G. Hall, Johnson & Higgins, and J. C. Coulter, PG and E, discussed the various types of transformer fire protection available, and presented some ground rules for the use of each of the various types of protection. The speakers stressed maintenance as an extremely valuable means of fire prevention.

Treating the topic of insulation coordination, L. M. Schoenig, Allis-Chalmers Mfg. Co., and L. D. Barter, Westinghouse Electric Corp., stressed the importance of determining the maximum voltage which can occur on a power system so that reduced insulation can be applied with a high degree of safety. The speakers noted a definite trend to insulation levels one, one and a half, and two classes below full BIL, and indicated that further insulation reductions are possible and will be given serious consideration in the future.

## Steam Generation

*Sponsor: I. R. Caraco, Bechtel Corp.*

Recent improvements in electric supply systems for power plant auxiliaries were detailed by A. B. Christie, Southern California Edison, Einar Nilsson, PG and E, and J. H. Zornes, California Electric Power. This trio of experts showed how improved equipment and operating experience are enabling modern power station designers to do without idle stand-by apparatus, and how bold, new approaches are eliminating auxiliary devices in modern power stations.

**Meetings can be thirsty business**

In still another session, N. L. Dickinson, Babcock & Wilcox Co., and J. B. Moore, Southern California Edison, discussed the principles and design considerations brought about through the use of the universal pressure boiler (see article p 65).

Taking a look at nuclear power stations, F. F. Mautz, PG and E, and Frank Eigner, Southern California Edison, reported on their companies' experience in nuclear generation. J. O. Schuyler, PG and E, followed with a description of his company's Humboldt station, which it is hoped will approach the economy of a conventional station. The final section of the nuclear roundup was carried out by W. Kenneth Davis, Bechtel Corp., in the form of a progress report on the future of fission and fusion power. He stated that he expected to see competitive fission power in high-cost fuel areas in the next two to four years, but indicated that fusion power was much, much further off. He pointed out that technologically fusion power had not reached the stage comparable to that when Fermi demonstrated a controllable chain reaction.

In the maintenance session, R. F. Cummings, California Electric Power, pointed out that today's electric systems required that smaller but relatively new generation equipment be laid up for relatively long periods of time. His discussion covered protective methods which would enable the equipment to be put back in operation with a minimum of maintenance effort.

PG and E's M. A. Balke and T. G. Caseboldt discussed their experience with various methods and equipment for ultrasonic testing of boiler tubes. They concluded that sonic testing was the only practical nondestructive testing method, and that it can be a real aid in the prevention of forced outages from tube failures.

A session on saline water conversion brought forth a discussion of flash evaporators by E. F. Stalcup, Westinghouse; and the new experimental saline water conversion plant to be installed by Southern California Edison, by Ralph Whistler of that company.

On the subject of water treatment, L. M. Hughes, Arizona Public Service, pointed out that proper water treatment can prevent excessive chemical deterioration in redwood cooling towers, as well as minimize the possibility of an infection by wood-destroying organisms. R. L. Garner, of the same company, dis-

Electrical West—Vol. 122, No. 5

cussed his experience in the use of filming amines as a tool for the reduction of feedwater corrosion.

In a session on boiler feed pumps, Byron-Jackson's T. E. Hall pointed to the necessity of building extreme reliability into today's boiler feed pumps which are directly connected to the turbine generator shaft. He showed that proved dependability can result in additional economies through the elimination of stand-by equipment.

R. N. Sarver, Southern California Edison, discussed operating experience with mechanical seals in boiler feed pumps, concluding that they were reliable under today's pressures and temperatures, and therefore economically justified.

## Hydro Generation

*Sponsor: G. K. Lewis, Allis-Chalmers Mfg. Co.*

W. G. Chaffin, Southern California Edison, discussed the equipment his company had developed to adjust waterwheel governors so as to obtain uniform response and achieve better control of system frequency.

M. A. Erskine, PG and E, discussed the operation and maintenance of his company's Feather River development. Two maintenance jobs that had been undertaken recently were discussed. In each case considerable savings were achieved by using new methods.

M. M. Montgomery, Paceco, discussed the general problems in the design of hydro cranes, both from a manufacturing and operating point of view.

J. V. Kresser, Westinghouse, presented a recommended protective system for a generator, main transformer and auxiliary transformer unit combination. His paper reviewed the performance under all possible abnormal conditions.

Milton Broderson, Pelton Division of Baldwin-Lima-Hamilton Corp., pointed out the inadequacy of hit-and-miss manual lubrication for unattended hydro stations, and focused attention on automatic lubrication systems. It appears, he said, that all future hydro plants will embody centralized lubrication systems.

P. B. Dawson Jr., also of Pelton, discussed the use of ultrasonic inspection as a means of detecting incipient flaws in impulse turbine wheel discs and shafts. To show how the ultrasonic technique had proved to be a valuable, nondestructive, preventive maintenance tool, L. M. Wood of Southern California Edison gave a case history of the ultrasonic inspections of Unit No. 2 at Big Creek Plant 2A, from initial testing in 1951 when the tests showed small, well dispersed inclusions to 1956 when a flaw of considerable size was detected that ultimately had to be replaced.

E. W. DuBois, Westinghouse, traced the development of excitation systems to a point where he concluded that the next great stride would be elimination of commutator slip rings and brushes. He then discussed an approach which utilized rotating semiconductor rectifiers, such as have been giving satisfactory service in aircraft systems.

H. H. Roth, Allis-Chalmers Mfg. Co., discussed the impact of reversible pumped-storage units on conventional hydrogenerator design. In spite of the many problems inherent in building a dual-purpose machine, he pointed out that pumped-storage units of 175 to 200 mw are entirely feasible.

**Weingarten** Westinghouse | **Stuart** PG and E | **Schnarr** SD G&E

**Davis** Bechtel | **Schuyler** PG and E | **Mautz** PG and E

## Engineering Design

*Sponsor: C. B. Bennett, Fluor Corp.*

In addition to a well-rounded joint program with other groups, the Engineering Design group heard R. J. Potts of Allis-Chalmers discuss the various factors which must be considered in the optimum selection of power plant motors. He discussed the improvements in motor drives brought about by new materials and methods.

Southern California Edison's O. R. Bulkley showed how standardized designs made possible savings in both the engineering and purchasing of substation components.

## Meter

*Sponsor: W. M. Nott, Sangamo Electric Co.*

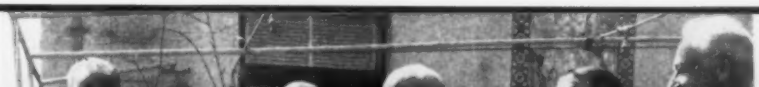
R. L. Tilford, San Diego Gas & Electric, W. J. Wright, Sierra Pacific Power, and A. J. Crowley, California Electric Power, discussed the possibility of losing revenue by using the class 200 meter. In general, they concluded that the light load accuracy was good enough to make losses, if any, insignificant.

K. W. Gardner of Southern California Edison discussed job instruction for new metermen, emphasizing that selection was of importance, and that in general selection should be limited to people capable of advancement with a reasonable amount of training.

A panel consisting of L. W. Bartholomew, PG and E, Earle Trenkle, Arizona Public Service, and Merle Acheson, Sierra Pacific Power, debated whether today's measurements of system characteristics were sufficiently accurate to support the costly decisions based on the measurements.

A. J. Crowley explored the question of what class demand registers





After the meetings there was much to be talked about—and good fellows to talk to

# PCEA-PCGA Administrative Services

"LET'S Look Over the Horizon" was the theme of the Administrative Services Conference held by Pacific Coast Electrical Assn. and Pacific Coast Gas Assn., at the Lafayette Hotel in Long Beach in April.

Leslie A. Hicks, PCEA president and president of Hawaiian Electric Co., looked over the horizon to see what needs doing now in order to assure investor-owned utilities that the economic climate will be right for them in the future. He recommends teaching the value of the free enterprise system to school children, because the opinions they are forming now will eventually determine the character of the business world.

He said the Joint Council on Economic Education is presently financing the writing and production of textbooks that will be supplied to schools. To illustrate the need for such a program, Hicks said that no more than 75 of the 1,800 colleges in the United States offer courses in public utility economics, and that no text on the subject is available. He recommended that associations like PCEA and PCGA should follow the Joint Council on Economic Education program to produce a good, unbiased text on the subject. He also suggested that royalties from the books might be used for scholarships.

## Manpower for Tomorrow

*Sponsor: Robert Watson, Southern Counties Gas Co.*

Startling facts about business organization weaknesses were discussed by Leslie H. Matthies, director of administrative research for Ross-Martin Publishing Co., Tulsa. Some trouble spots that are found just about everywhere, according to Matthies, are:

1. Supervisors are not trained for their jobs.
2. They are not objective. They act emotionally.
3. The morale, even of the best people, is low in most organizations. Work is spiritless.
4. Supervisors don't know how to work through other people.
5. They don't know how to plan.
6. Managers aren't effective because they don't know how to use

to use with class 200 meters. There was an indication that class 6 registers with class 200 meters was the trend.

Earle Trenkle and E. J. Stimpson, PG and E, gave their views on ultrasonic cleaning of demand registers. H. E. Naegeli, Southern California Edison, solicited the group's comments on polyphase meter accuracy at low power factors and heavy overloads.

H. C. Broocks, PG and E, and Earle Trenkle discussed their experiences with 200-amp meter sockets.

H. D. Meyers, Pacific Gas and Electric, and A. J. Crowley discussed the subject of accuracy of rotating standards when operated from 208 to 277 v, and concluded that there doesn't appear to be any reason why equipment should not be sufficiently accurate within this voltage range.

Burke Breedlove, San Diego Gas & Electric, and James Roth, Hawaiian Electric, participated in a panel discussing the adoption of self-contained meters on 200-amp service.

D. Kimball, Southern California Edison, reviewed the various methods of transferring the standard kilowatt-hour from the laboratory to the various meter test boards. He concluded that use of the Knopp TE-5 test board on wheels was the best method of making a complete calibration at yearly intervals, while a group of modified watt-hour meters could be used throughout the year for spot checking.

H. E. Naegeli gave his views on accuracy testing of indicating in graphic demand meters; followed by a presentation on the part of manufacturers of new products of interest to the meter group.

## Communications

*Sponsor: C. J. Schnarr, San Diego Gas & Electric Co.*

L. E. Ludekens, Southern California Edison, opened the Communications session with a report on the status of recent FCC actions. This was followed by a discussion of the "Southwest Committee for Utilities Radio," and the function of this group in preparing frequency assignment patterns for the states of California, Utah, Arizona and Nevada was pointed out to the group.

C. B. Riechers, PG and E, discussed the impact of channel splitting on the operation of power radio users' mobile systems. He pointed out that this action had created additional channels, but confronted the owners of older mobile equipment with the problem of modifying it or replacing it in order to comply with the new technical standards.

L. L. Creighton, PG and E, surveyed the present-day office requirements for power and communications circuitry. He pointed out that adequate communication cabling requires consideration of the power circuitry. He drew attention to the tremendously increased requirements for both power and communications circuitry, ranging from today's complex communication systems to the surreptitious electric shaver or curling iron.

Southern California Edison's K. E. Dueker pointed out that microwave equipment should be evaluated against the user's requirements, rather than in terms of the various products offered by suppliers.

In a joint meeting with the System Operations and Substation groups, C. R. Nickerl, Southern California Edison, and Charles Morris, E. S. Condon Co., presented a joint paper covering the equipment which has evolved since the FCC authorized operational fixed stations on a mobile frequency for the sole purpose of indicating failures to power systems.

A discussion of the safety problems confronting the communications technician with some recommendations as to what can and should be done to instill safety consciousness in communications technicians, was presented by R. G. Schumaker, PG and E.

The final session of the Communications group was a discussion of recent developments in communications equipment by Robert Peth of Motorola, I. T. Corbell of General Electric, W. V. Dent of Westinghouse and S. J. Combs of Radio Corp. of America.

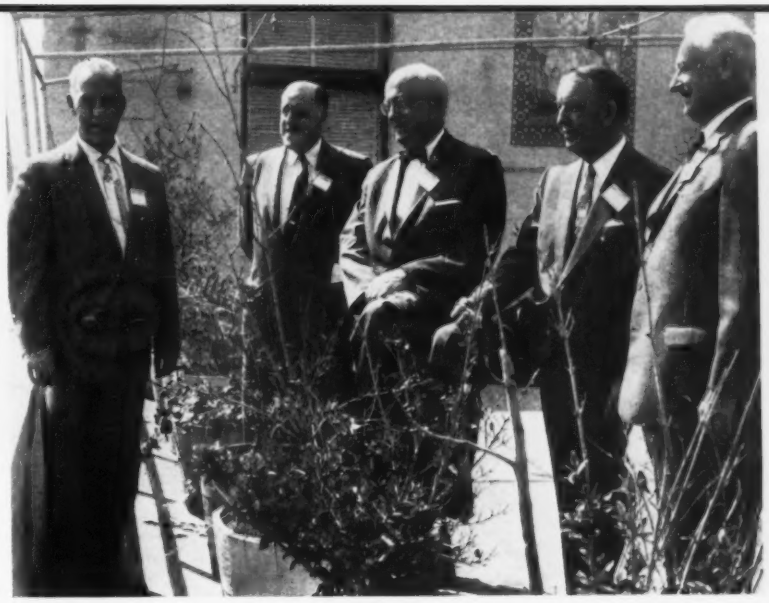
control specialties such as systems, audits or budgets.

7. We haven't learned how to evaluate a manager's real effectiveness. Often he seems effective because his operating people carry him. They work so well that the organization succeeds despite mismanagement.

8. Seventy-five per cent of the men in management jobs haven't the haziest idea of what the job of managing really is.

9. Managers fail to provide the real leadership that the working people want and need.

He said, "If we are smug, if we are satisfied with the crude organizations that we have today, we may be in mortal danger. We are in danger in our industries, in our government, in our military."



**John Mead, Vic Hartley, Graham Holabird, Sam Scott and George Hawley talk over events on the Lafayette roof garden. Nearly 200 persons registered for the busy, two-day session**

John R. Kleespies of Pacific Gas and Electric Co., talking about organization planning and development, said, "Today, technology and human relationships have become so complex that we are developing the philosophy and techniques of another specialty: organization planning and development."

He said the objective of organization planning and development is nothing more or less than a facet of the major motivation of any organized group – that of providing the best means for assuring the health and continuity of the organization. "An organization of human beings takes on one of the major instincts of any living thing: the instinct of self preservation." Required in good organization planning, Kleespies said, is the continuous consideration of factors such as new technological developments, changing relationships, new management techniques and company growth, in establishing the best framework possible for people to work in effectively and with maximum productivity.

"Each individual manager should have the opportunity to perform within the bounds of his capacity and the objectives and functions of his job." This was the statement by Keith Turley of Arizona Public Service Co., in his talk on "Managing People for Peak Performance."

Turley said the individual demands work that will utilize his abilities to judge, to integrate, to coordinate, to imagine, to exercise initiative, and to control himself. To perform at peak performance, a man must be responsible for his own actions. All that managers can do is to organize the work and then leave the worker to accept this responsibility.

Four fundamentals for making an organization work were presented by John E. Jacobs, Southern California Gas Co. The fundamentals are:

1. The formulation and acceptance of specific objectives for the organization as a whole, and for each part of it.

2. The assignment of responsibilities in terms of precise objectives, and the understanding and acceptance of these responsibilities in terms of the agreed-on standards.

3. Continuous appraisal of individual performance in terms of the agreed-on standards.

4. Awards, penalties and other corrective action based on these appraisals.

Jacobs called these fundamentals "The Cutting Edge of Organization," and he also referred to them as the types of communication necessary to make an organization effective.

**"Woodshedding" sessions, as always, gave the important opportunities for idea exchanging**

## Cost Control

*Sponsor: William Drewry, Southern California Edison Co.*

Jerome B. Pallock, Southern California Gas Co., and Paul W. Richardson, Southern California Edison Co., discussed two roads to manpower control. Pallock described a work measurement program intended to assure that work was properly assigned by job grade level. It made it possible to evaluate indi-

C. W. De Voe
San Diego G&E

James Cantlen
Pacific Tel & Tel

Gene Kruger
Edison

vidual job performance, give overall perspective of office organization, determine the number of people required, and it provided a formula for manpower control.

Richardson described the theory that a well-trained management indoctrinated supervisor can increase productivity, make more effective use of manpower and control costs to a degree not possible through the use of staff imposed time and motion study techniques.

An experience report on the use of mark sense meter reading by Guy W. Prior of California Electric Power Co. confirmed that mark sense meter reading effects rapid and accurate input data, more flexibility and better control than is possible by using meter books.

Creating the position of district supervisor in 19 district offices of Southern California Edison Co. resulted in a reduction in the number of meter readers, a 30% reduction in mileage driven, saving the capital expense of two company automobiles, a 26% increase in productivity, better morale and reduced turnover of personnel. This report was presented by Frank J. LaChance of Edison. He also reported on the successful use of a unit system to handle assignments of commercial service men.

Paul J. Okerstrom, Pacific Tel & Tel Co., told the group about a new data phone service being developed by the Bell System to provide high-speed transmission of data in digital form over voice circuits, including regular telephone connections. The system is designed to be used in conjunction with various business machines using punched cards, magnetic tapes and multichannel tapes.

Edison's method of handling emergency and after-hours calls from the public was described by L. N. Swanson of Pacific Tel & Tel Co. In the Compton district, for example, carefully planning the operation resulted in elimination of one employee and considerably fewer calls to a single office.

"While there are some pretty fabulous developments under way for our space age business offices of the future, our business office representative will continue to be the business voice of the company." This was a statement by A. B. Berning of Pacific Tel & Tel Co.

A panel composed of Charles L. Baker, Southern California Gas Co., Kenneth E. Bone, PG and E, and T. M. Jackson, and headed up by O. S. Blackstone, Southern Counties Gas Co., discussed "Cost Control in Credit & Collections."

## Relocation Accounting

*Sponsor: J. L. Green, Southern California Gas Co.*

As the amount of utility relocation work is on the increase, the problems of accounting to government agencies for reimbursement are increasing too. Usually, more information is needed for an invoice to an outside agency than is needed for the general run of work orders. M. A. McKinley, Southern Counties Gas, said the most economical way of providing the extra information is to accumulate specialized details separately rather than design the work order system to accumulate the specialized data for all records.

E. G. Huot, Edison, discussed changes in the recently approved NARUC uniform system of accounts. The new system is a result of 10 years of study by Edison Electric Institute, the American Gas Assn., and NARUC.

F. W. Duelks, Southern California Gas, said, "Collectible work for public agencies, particularly work done on freeway and highway construction, requires more in the way of preparatory work for estimating, programming and planning than do normal utility projects involving the installation and replacement of facilities."

All of the construction work on utility facilities must be programmed to meet the construction schedules for each section of freeway, such as clearance of the right-of-way, bridge construction, on-off ramps, etc. Duelks said a look over the horizon indicates there will be even more complexities affecting collectible work.

In these times of mounting costs, rate increase applications are becoming more and more frequent. Roy Davis and Granger Hill of PG and E presented the theory that any steps taken to improve or expand accounting records to furnish more up-to-date and complete data for use in rate case presentations should result in quicker and more favorable decisions by the regulatory commissions.

## Machine Accounting

*Sponsor: John Brass, Pacific Gas and Electric Co.*

The IBM 7070, one of a new breed of computers that can grow as more capacity is needed, was described by O. T. Johnson of Edison. It is a transistorized all-purpose medium-to-large scale digital computer. Because of modular construction, the user can select the required number of components to handle his company's data processing work load, and can add components as the volume of work increases. Costly reprogramming and conversion projects are minimized.

Richard M. Brisbin, Southern Counties Gas, said the solution to problems arising from increased work load in utility building departments appears to be newer and better machines. He said the utility industry is fortunate that manufacturers of tabulating equipment are concerned with the problems of the utilities and are therefore developing the needed machinery.

The use of an IBM 604 by Cali-

**W. C. Drewry**
Edison

**John Brass**
PG and E

**G. E. Jenner**
San Diego G&E

**J. S. Green**
So. Cal. Gas

**R. H. Watson**
So. Conn. Gas

**Raymond White**
PG and E

fornia Electric Power Co. was discussed by Bernard C. Meith. Calectric uses the machine for six general accounting applications, plus customer billing and accounting, pay roll, stores accounting, property accounting and general accounting.

Arizona Public Service Co., gaining more experience with its Univac, has found that if all distribution charges are reported on a compatible basis for each accounting area, and all charges and credits accounted for, all postings to the general ledger can be produced by the computer. Also, complete operating and financial reports for management can be produced on any desired level. Merle J. Wardenburg reported on the company's experiences.

Dexter Stoner, PG and E, told the group that electronic data processing in the utility business has a "relatively short past, an intriguing present and a tremendous future." PG and E's IBM 705 is turning out 45,000 bills a day and is a completely integrated revenue accounting system. Stoner said the great need in the computer field is in the development of peripheral equipment geared to complement the high speed of the computer. Also needed is higher speed printing at less cost than at present.

## Purchasing

*Sponsor: George Jenner, San Diego Gas & Electric Co.*

Many people in the electrical industry believe that inflation in the electrical wire and cable portion of the industry can best be combated by a concerted effort on the part of utility companies to standardize both the types and the packages of conductors in every day use, according to J. L. Tindale, commercial vice-president, Anaconda Wire & Cable Co.

Progressive companies, attempting to get maximum value for their purchasing dollar, are quite often turning to a systematic approach to value analysis of purchased materials. Because of this approach, advanced managements have radically revised their concept of the industrial purchasing function — now consider it a definite profit-making activity. These thoughts were presented by H. W. Christensen, Columbia Geneva Steel Division of U. S. Steel.

R. P. Benton described scientific stock control as it is applied at PG and E. He said that what is probably the most important fact about scientific stock control is that, in almost every company, stock levels controlled by some kind of rule of thumb are the subject of a tug of war between the operating and the financial interests. Operating people are concerned about having enough material to do the work, persons responsible for financial affairs are concerned about having a low stock investment. Scientific stock control establishes stock levels and therefore stabilizes materials and supplies investment, in a logical manner that can be supported by both operating and financial interests.

Inventory control from a purchasing standpoint was discussed by G. W. Kelly of Kaiser Steel. Corporations, even in the same industry, cannot use the same yardsticks to determine their inventory requirements because of their own peculiar methods of operation, geographical locations and financial positions. The services to be rendered, the goods to be produced, and the requirements of maintenance of facilities and plant construction must all be considered in arriving at the proper level of inventory.

D. B. Kitchel, also of Kaiser Steel, told how his company is preparing to apply machine accounting to the purchasing function. He cautioned that to jump from common forms and hand-posted inventories to completely mechanized systems is in every respect possible today, but it is too great a move to be efficiently accomplished at one time.

A. E. Jones of Koppers Co. Inc., in discussing an objective approach to multi-plant purchasing, pointed out advantages and disadvantages of centralization and decentralization. He said that the best solution so far discovered is a "middle of the road" policy, which employs the better features of both systems. He explained that although certain purchasing functions were delegated to geographically remote plants, certain controls and coordinating activities are required through the central procurement office.

Other comments on the application of computers to the purchasing function were made by Kenneth Brown of IBM. He, too, said, "Probably we should all walk before we run in this area, but right now the machines are ready for us to go as fast as we wish." He said the areas where the purchasing personnel's knowledge and experience might be recorded and reused in normal transactions is where data processing systems will probably be used.

Benefits of accounting, auditing and purchasing departments, working as a team, were related by E. C. Austin of Fluor Corp. It is his theory that purchasing management needs many tools to measure its effectiveness. Accounting can furnish help on the current basis. Auditing can assist with observations from the annual audit. The major benefit from the auditing department is that it has an opportunity to have an over-all perspective that is not available to many members of other departments. The teamwork that he recommended can succeed if purchasing, auditing and accounting recognize their own limitations without relinquishing their authority and responsibility. They offer checks and balances for each other.

# NEW!

## ROME *TRIMLINE** PRIMARY DISTRIBUTION SYSTEM

### WITH A NEW SIMPLIFIED, STREAMLINED SPACER DESIGN!

**A Practical Overhead System.** Developed for utility and industrial distribution circuits ranging from 5 to 15 kv, Rome's TRIMLINE* system consists of (1) a unique and highly simplified Plexiglas supporting spacer, (2) extruded black, high molecular weight polyethylene insulated phase conductors (either one, two, or three phase), and (3) a high strength supporting messenger.

This economical method of overhead distribution is recommended for installations where:

- additional circuits are required on a pole
- poles are too crowded
- bad tree and storm conditions cause havoc with open-wire lines
- alleyways prohibit use of crossarms

. . . and especially where a *compact* and *neat-appearing* distribution system is necessary!

**System Features New Spacer.** Now . . . a new spacer design makes Rome's TRIMLINE* system as reliable as it is practical. The one-piece Plexiglas spacer offers distinct "reliability" features. It has no mating or matching surfaces to form cracks or crevices which collect water or other contaminants. This in turn reduces the possibility of eventual arcing or shorting.

Each spacer is equipped with four "snap-lok" neoprene grommets (adapters). Special molded-in compression rings in each grommet assure a snug spacer-to-cable fit. The constant pressure exerted upon the messenger and conductors restricts the spacer from "traveling" on the line.

The spacer itself is shaped like a diamond with rounded corners and smooth edges. When installed, each of the phase conductors and the messenger are completely contained within the encompassing spacer unit.

Installation of the spacer unit is performed with no tools or special equipment, requires *no* nuts or bolts. And maintenance is just as easy—phase conductors can be removed or added without removing the spacer from the messenger. Spacers are placed approximately thirty feet apart along the entire length of the distribution system.

*T. M. (patent applied for)

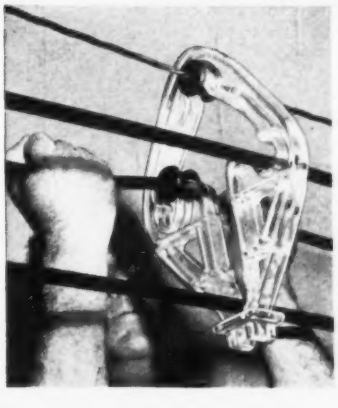
**HERE'S WHAT THE TRIMLINE SYSTEM OFFERS YOU:**

1. A *single* spacer for 5 to 15 kv range.
2. Abrasion-resistant high molecular weight polyethylene insulation or other suitable materials as specified by the user.
3. Neoprene grommets with molded-in compression rings.
4. A spacer that completely encloses phase conductors and messenger.
5. A high strength supporting messenger that provides storm damage protection, thereby permitting . . .
6. Longer spans—the system messenger permits spans up to 300 feet.
7. Positive phase identification by position in spacer.
8. Lower reactance than conventional open-wire lines.
9. Ease of installation.
10. Neat, compact overhead distribution. Better public relations.

Send in the coupon for our new bulletin on Rome TRIMLINE* Primary Distribution System.

*For phone number of closest representative see advertising index in back of book.*

SEND FOR FREE BULLETIN!



# ROME CABLE

## CORPORATION

**Dept. 4, Rome, N. Y.**

I want more information on the Rome TRIMLINE Primary Distribution System. Rush me my free copy of Bulletin RCP-790.

*Name* .....

*Title* .....

*Company* .....

*Street* .....

*City* ..... *State* .....

Code panel—Ed Muller, state; L. A. Pascoe, G-E, moderator; G. A. Wintz, city; Arthur C. Veit, county, code experts

### EMEA members at Los Angeles . . .

# Learn New Methods

Industrial power—W. D. Bonzer, Larson-Hogue; Emerson S. Reichard; Col. F. Snyder and Robert N. Marcum of Hughes. Estimating—Henry Hopkins, left, Charles Hays, right, Electrical Estimators, and Paul Diederich, Olympic Electric. Lighting—Urban Beh and Ed Balogh, two of five speakers

AN intensive concentrated schooling on electrical codes, control and automation, industrial power systems, maintenance of electrical equipment, plant lighting and estimating of additions and expansions was afforded the Electrical Maintenance Engineers of the Southern California area at the intensive three-day conference March 24-26 at the new Los Angeles Furniture Mart. Designed to bring its participants up to date quickly with new methods and techniques the conference of separate sessions on each subject made use of the experience and knowledge of 32 experts in their field.

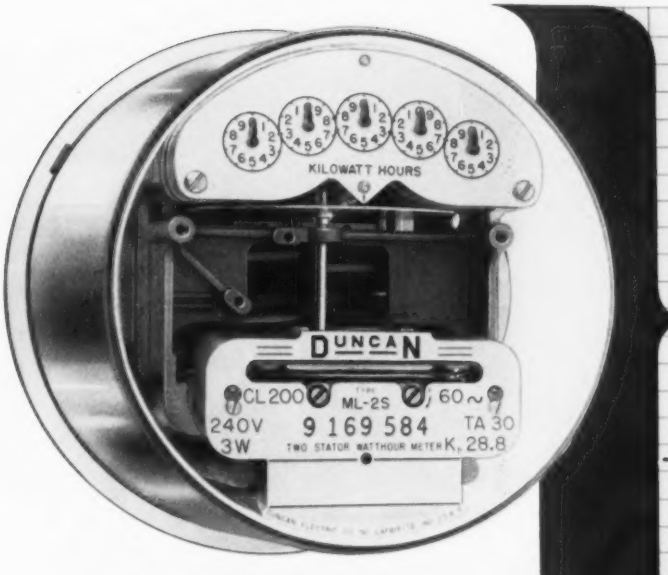
General chairman was William E. Cline, General Electric Co., and panels were presided over by Lou Pascoe, G-E; Richard L. Somer, Federated Engineering; Emerson S. Reichard, General Petroleum; Barney Shrive, Kaiser Steel; Urban Beh, consulting engineer; and Charles Hays, The Electrical Estimators.

Accompanying picture shows some of the participating panel members and chairmen. Unfortunately space does not permit full coverage of the extremely wide scope of subjects covered or even naming of all of the speakers.

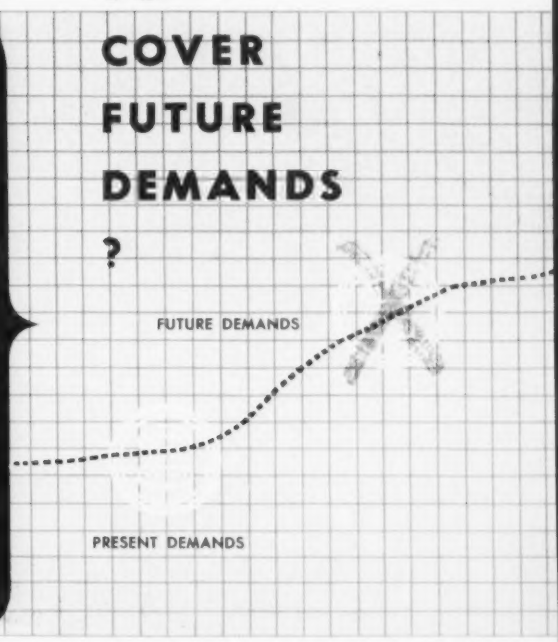
A concurrent display of new electrical products by some 50 manufacturers was made prior to the dinner meeting on March 25 at the Rodger Young auditorium.

# *why pay twice*

**TO COVER FUTURE DEMANDS ?**




**ML-2S Class 200**

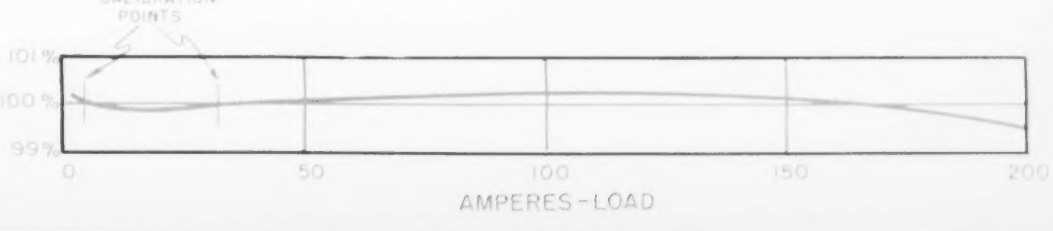



## DUNCAN 200 AMP extended range polyphase meter

- **Accurately meters loads up to 200 amperes**
- **Reduces cost of replacement to meet increased demand**
- **Gives you more metering capacity per dollar**

DUNCAN Extended Range Meters can substantially reduce your metering costs. For example, the DUNCAN ML Class 200 Socket Type Polyphase meters accurately measure loads from a few watts to the meter's full 200 ampere capacity. Thus, it stays on the job long after increased demand has made it necessary to replace meters of lower capacity. You save both on installation time and on the cost of new meters . . . you get more metering capacity and longer metering service per dollar spent.

When you install DUNCAN meters you are assured of the finest performance that over 50 years of specialized meter experience can provide. One significant example is the long range load curve shown below.




**"Thinking Ahead . . . Moving Ahead . . . to stay Ahead of Demand!"**

# DUNCAN "COMPANIONS"

save space • save time • save money

## EXTENDED RANGE POLYPHASE METERS

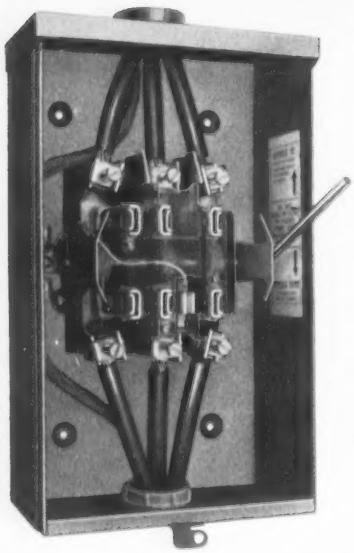
DUNCAN
ML-2S Class 200
3-Phase 3-Wire

ML - 2½S

3-Phase 4-Wire Wye

ML - 2S△

3-Phase 4-Wire Delta



# DUNCAN

## HQ | High Capacity-Quick Operating MOUNTING DEVICE

*. . . featuring simultaneous by-passing and releasing of meter clamps*

DUNCAN Type HQ mounting device (singlephase or polyphase) is conservatively rated for high load factor loads up to 200 amperes using self-contained socket type meters having a maximum capacity equal to the load to be served. DUNCAN HQ has many important construction and "use" features which add substantially to convenience and economy of installation.

← TYPE HQ-7

**Used with 7-terminal meter on 3-phase 4-wire wye or delta services**

TYPE HQ-5

**Also Available May be used on 1, 2 or 3-phase 3-wire services**

*Write direct to Duncan Electric for descriptive data and bulletins on Duncan Extended Range Polyphase Meters and High Capacity Mounting Devices.*

**DUNCAN ELECTRIC COMPANY, INC., Lafayette, Indiana**

"THINKING AHEAD . . . MOVING AHEAD . . . TO STAY AHEAD OF DEMAND"

LIVE BETTER ELECTRICALLY WITH FULL HOUSEPOWER

*New* Lighting Combination

Installed by

**Fischbach and Moore**
Incorporated

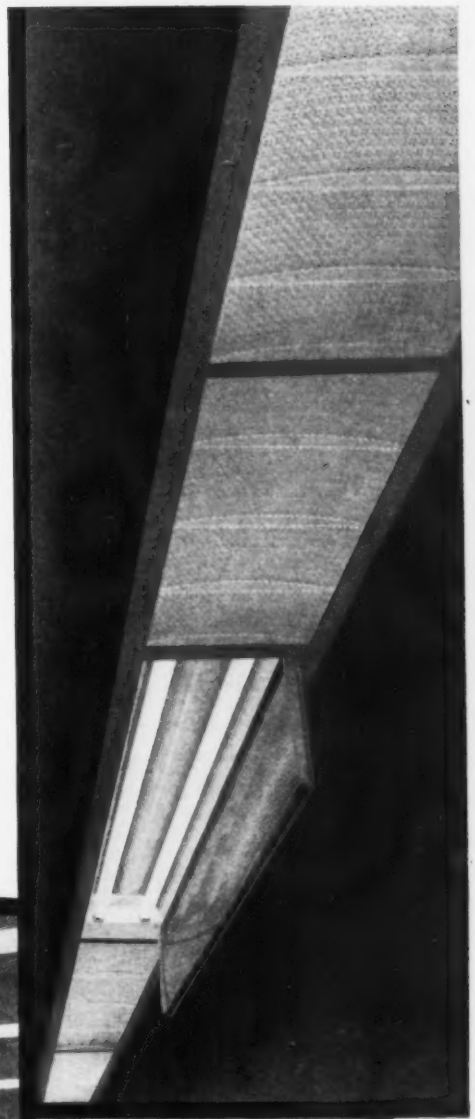
in their own quarters...

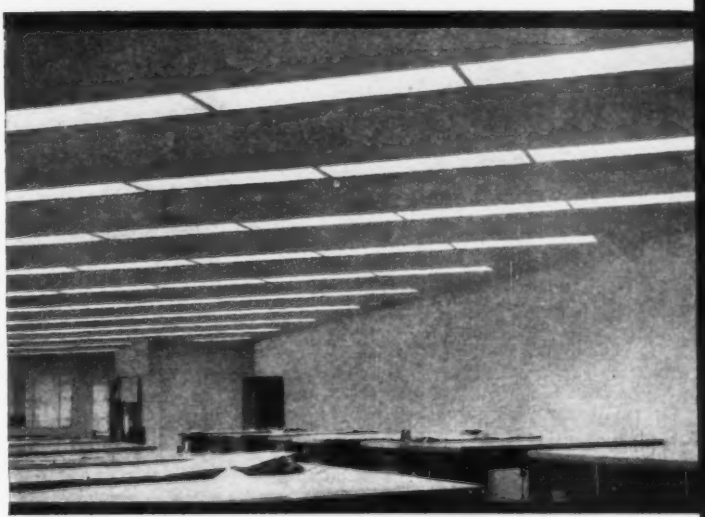
•

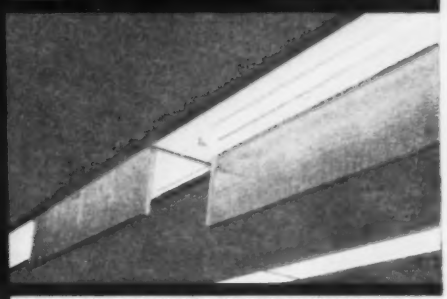
**HOLOPHANE**
**Prismalume* Controlens***

**in GLOBE**
**"Miracle-Door"† Troffers**

When one of the world's foremost electrical contracting firms chooses specific lighting products for its own use—that's noteworthy! Fischbach and Moore, Incorporated, installed GLOBE "Miracle-Door" Troffers equipped with the HOLOPHANE Lo-Brite* Prismalume Controlens in their recently occupied New York quarters... The prismatic Controlens, made of crystal-clear acrylic plastic, is one piece, 4-foot long. It directs color-true, maximum illumination to vital areas, minimizing brightness and glare... Globe "Miracle-Doors" hinge open from either side; the "Hi-V" reflector plates are also reversible. This instant flexibility accommodates the partitioning requirements typical of today's modular construction... Send coupon today!







**HOLOPHANE Company, Inc.**
342 Madison Ave., New York 17, N. Y.

**GLOBE Lighting Products, Inc.**
16 E. 40th Street, New York 16, N. Y.

*® †Pat. Pend.

HOLOPHANE CO., INC., 342 Madison Ave., N.Y. 17
Please send us data on: Prismalume Controlens in Globe "Miracle-Door" Troffers.

INDIVIDUAL _____

ORGANIZATION _____

STREET _____

CITY _____ ZONE _____ STATE _____


*For phone number of closest representative see advertising index in back of book.*

THE MAN WHO HAS TO KNOW . . .
W. E. DUGDALE, PURCHASING AGENT
TELLS WHY . . .

# SERVICE pays dividends for Upper Peninsula Power's investment in General Electric Voltage Regulators

"Overnight delivery of a General Electric ML-32 Voltage Regulator from the Chicago warehouse cut outages to a minimum recently after a 3-phase line fault. Consistently prompt G-E service helps us give reliable power to our customers."

General Electric service means the widest and most experienced network of service shops and application engineers available to utilities. G-E service means quick regulator delivery from local warehouses, and rapid repair at local service points—ready for any regulator emergency, seven days a week. And service means complete regulator engineering assistance before, during, and after the order.

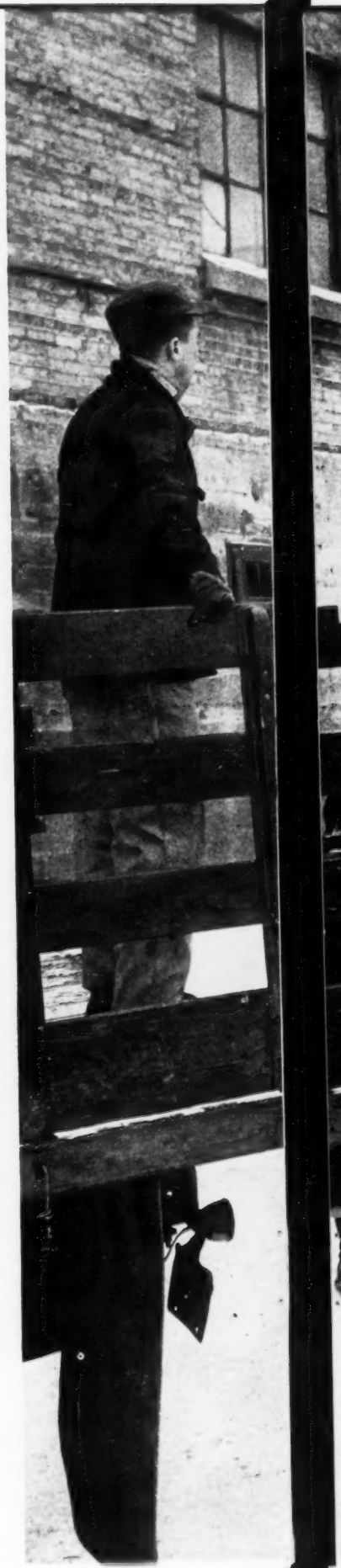
**G-E REGULATORS COST LESS ON THE LINE** because you get continuing extra dividends . . . from **G-E SERVICE**—routine or emergency; from **G-E RESEARCH**—superior regulating equipment; from **G-E DEPENDABILITY**—absolute minimum maintenance. Result: Extra Values—**EXTRA PROFIT.**

Only General Electric returns so much for your regulator investment. Ask your General Electric Regulator Representative to show you how. General Electric Co., Schenectady 5, N. Y.

423-36

*Progress Is Our Most Important Product*

GENERAL ELECTRIC



# news

**Fred Curle, sales manager for Denver district of General Electric's Major Appliance and Television Division, shows off dishwasher in one of the baggage cars used for showing G-E's new spring line in the Rocky Mountain region. Factory experts were in the cars to explain new features**

## Management

### Columbia's Canadian Flow May Be Altered by Project

Hydroelectric potential of the Columbia and Kootenay river area in B. C. is under consideration by the International Joint Commission. The project, costing $1 billion, would provide for 60% of the power needs of British Columbia and the Pacific Northwest of the United States by 1985. It calls for building at least eight great dams across the two rivers before the Columbia, into which the Kootenay empties, crosses the border near Trail and flows through the Northwest states to the Pacific.

One scheme, which the engineering board appears to favor, calls for partial diversion of the Kootenay headwaters into the Columbia with a dam at Copper Creek.

Another scheme calls for backing up the Kootenay into the Columbia from a dam close to the U. S. border, reversing the flow of the Kootenay from this point to swell the Columbia volume.

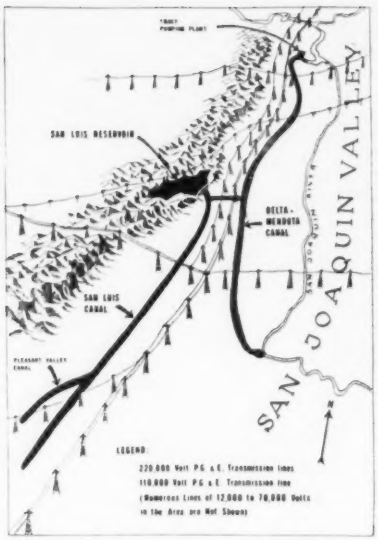
### Tacoma Seeks PSP&L Distribution Properties

Tacoma City Light is considering acquisition of Puget Sound Power & Light Co. distribution properties in areas adjacent to the city, an informal joint session of the city council and utility board March 30 revealed. E. K. Murray, board member, asserted City Light should extend its services to serve the city's primarily residential "tributary area" if the utility is to maintain balanced loads. At present, City Light is "overbalanced on industrial loads," he said.

One of the problems in acquiring the additional distribution lines is the amount of the payment in lieu of taxes which the utility would be required to pay to Pierce County. In the acquisition of one section of power company lines last year, the council contended that the utility's "in lieu" payment should be in addition to its 8% gross earnings tax while the board contended the payment should be deducted from the 8% tax.

As a compromise, the two agencies likely will agree for this year to deduct half of the "in lieu" payment from the 8% tax while a study is made to determine if the 8% tax is proportionate to what a private utility would pay in taxes. Total payment amounts to $6,000.

► **City Light Department,** Seattle, Wash., has had its request for $1,300,000 to be used in increasing the electrical capacity of City Light's Canal substation approved by the Board of Public Works and recommended to the city council. **Paul J. Raver,** City Light superintendent, said the substation is among properties taken over by the city from Puget Sound Power & Light in 1951. Two transformers would be replaced, among other extensive improvements.




### Congress Given Offer To Pare San Luis Costs

Use of existing Pacific Gas and Electric power transmission lines on the route of the San Luis project in central California was offered the federal government today with the prediction that it would save about $10 million in federal expenditures. The project calls for canals and pumps to transfer large volumes of irrigation water to the San Joaquin Valley.

As proposed, the project includes items costing in excess of $14 million for federal transmission lines, switchyards and substations. Robert Gerdes, PG and E executive vice-president, said that about $10 million of that amount "for duplicating transmission facilities is unnecessary." Existing PG and E lines have the capacity to serve all parts of the San Luis project, he asserted, and power could be delivered at lower cost by PG and E than over government lines. Gerdes emphasized his company's support of the project, and requested that the authorization bills be amended only to provide for federal use of company transmission facilities where it can be done at less cost to the federal government.

## High Head Plants Gained Through Partnership

Pacific Gas and Electric Co. will become a partner with California's Oroville-Wyandotte Irrigation District soon in a significant local-level power and irrigation project. Only formalities are holding up PG and E's signature on a contract with OWID which would guarantee the district $2,830,000 a year for lease of power facilities plus $312,000 annually for operational maintenance, on a projected development of the south fork of the Feather River. The sum would be paid by PG and E on a semiannual basis for 45 years, commencing with completion of the dams. Under the terms of the contract, PG and E would operate and maintain the facilities.

Construction bids are scheduled to be opened in San Francisco May 5. Total costs are expected to reach $55 to $58 million.

Major power houses will be Woodleaf, with an effective head of 1,427 ft and a 58,000-kva capacity and Forbestown, with an effective head of 828 ft, giving a 31,000-kva capacity. A third plant, the Kelly Ridge facility, will generate power temporarily from surplus water until such time as the water is needed for irrigation and domestic purposes. Kelly Ridge will have a capacity of 11,000 kva from an effective head of 613 ft.

## REA Awards

**Raft River Rural Electric** Cooperative, Malta, Idaho, was given $993,000 to finance construction of 114 miles of distribution line and 20 miles of 138-kv transmission line, together with other system improvements.

The **Jemez Mountains Electric** Cooperative, Espanola, N. M., received a $1,440,000 loan for the construction of 368 miles of distribution line, 67 miles of 69-kv transmission line and a 1,500-kva substation at Counselor and a 5,000-kva substation at Huerfano. The new transmission line will make possible service to 442 new customers.

**Continental Divide Electric** Cooperative, Grants, N. M., was given $1,507,000, out of which funds will be constructed 68 miles of 115-kv line, 27 miles of 69-kv line and three substations totaling 30,000 kva. The cooperative will also construct 308 miles of distribution line to serve 1,368 new rural customers.

The **Empire Electric** Assn., Cortez, Colo., will construct 109 miles of distribution line, 13 miles of 44-kv transmission line, two new substations and other system improvements from a $1,332,000 REA loan.

## Growth

► **Chelan County PUD** has called for bids for a new substation to increase the electric capability in the downtown area of Wenatchee.

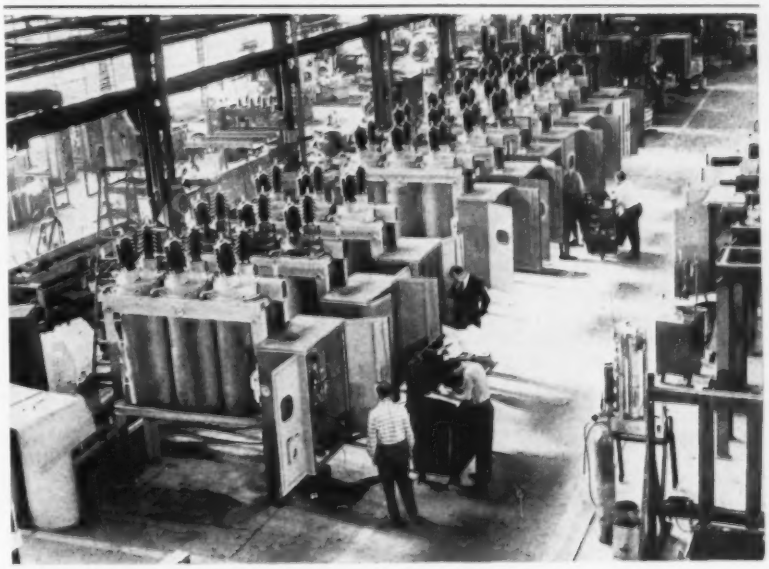
► The **Army Engineers** are inviting bids for construction of Cougar Dam on the south fork of the McKenzie River. The $43 million project, when completed, will have an installed electrical capability of 25,000 kw. It will be in operation in 1962.

► **White Mountain Power** Cooperative Inc. of Dyer, Nev., has been granted a $565,000 REA loan for construction of power facilities to serve customers in the Fish Lake Valley area on the California-Nevada border. The project will include transmission, substation and distribution facilities.

► The first unit of the Yuma Axis steam plant is in limited operation. The $12 million unit represents the first step in the development of a power pool in which **Calectric** and **Arizona PS** are cooperating. Calectric owns the newly completed unit with APS scheduled to build a second unit when needed.

► **Pacific Power & Light** Co. has under way a $7 million expansion program bolstering its transmission and substation facilities in the Portland metropolitan area. It will increase PP&L's capacity in the city by 50%.

► **Chugach Electric** Assn.'s $12 million Cooper Lake project is well under way. Bids totaling a third of the project's construction cost have already been let. The remainder of the major construction work will be advertised this spring.



**Circuit breakers for a Los Angeles Department of Water & Power expansion program are in the Allis-Chalmers Boston Works prior to shipment. Water & Power has ordered 12 of these 1,200-amp, 34.5-kv, 1,500-mva circuit breakers for installation in various system distributing stations and related customer industrial stations. They are type FZO**

# Association Affairs

San Joaquin Chapter, NECA, group at California-Nevada Conference: Ralph Smith, delegate; Glen Bockmon, Bockmon & Womble, governor; Al Massa, J. Con Franke Co., vice-president; and George Flint, Chapter manager, Stockton

Matt Gallager, Northern California Chapter, NECA, assistant manager, and Charles Scholibo, new NECA regional director

## NECA

Growing importance of the California-Nevada Conference of NECA Chapters as a coordinating medium between the contractor organizations in the two states was well demonstrated at the quarterly meeting held in Berkeley at the Claremont Hotel March 20 and 21, presided over by J. D. O'Connor, District 9 vice-president. Representatives from all of the chapters in the two states, either president, governor, manager or all three, spent Friday afternoon and Saturday morning on NECA activities and particularly pending legislation.

Ernest Kramm, manager, Northern California Chapter, Oakland, and the conference's representative on the Construction Industry Legislative Council, gave a complete report of pending legislation and of the attitude toward the various bills expressed by the legislative committee.

A plan to incorporate the conference and perhaps change its name to a council to conform to the national constitution was considered by the group.

Charles Scholibo, recently named regional director for the Western states, addressed the group and announced that his office would be located in the Phelan Building in San Francisco in mid-April.

Also heard were Dexter Jewett, field representative, and Kenneth Maddox of NECA staff, Washington, who discussed the revision of the accounting system. He has been surveying the area to talk to those who have been using the mechanical accounting system developed last year. James Murphy of NECA staff from Phoenix also spoke. He is making field studies in advance of a course on business management which will be run in workshop style for Western members. Murphy makes his office with the NECA in Phoenix.

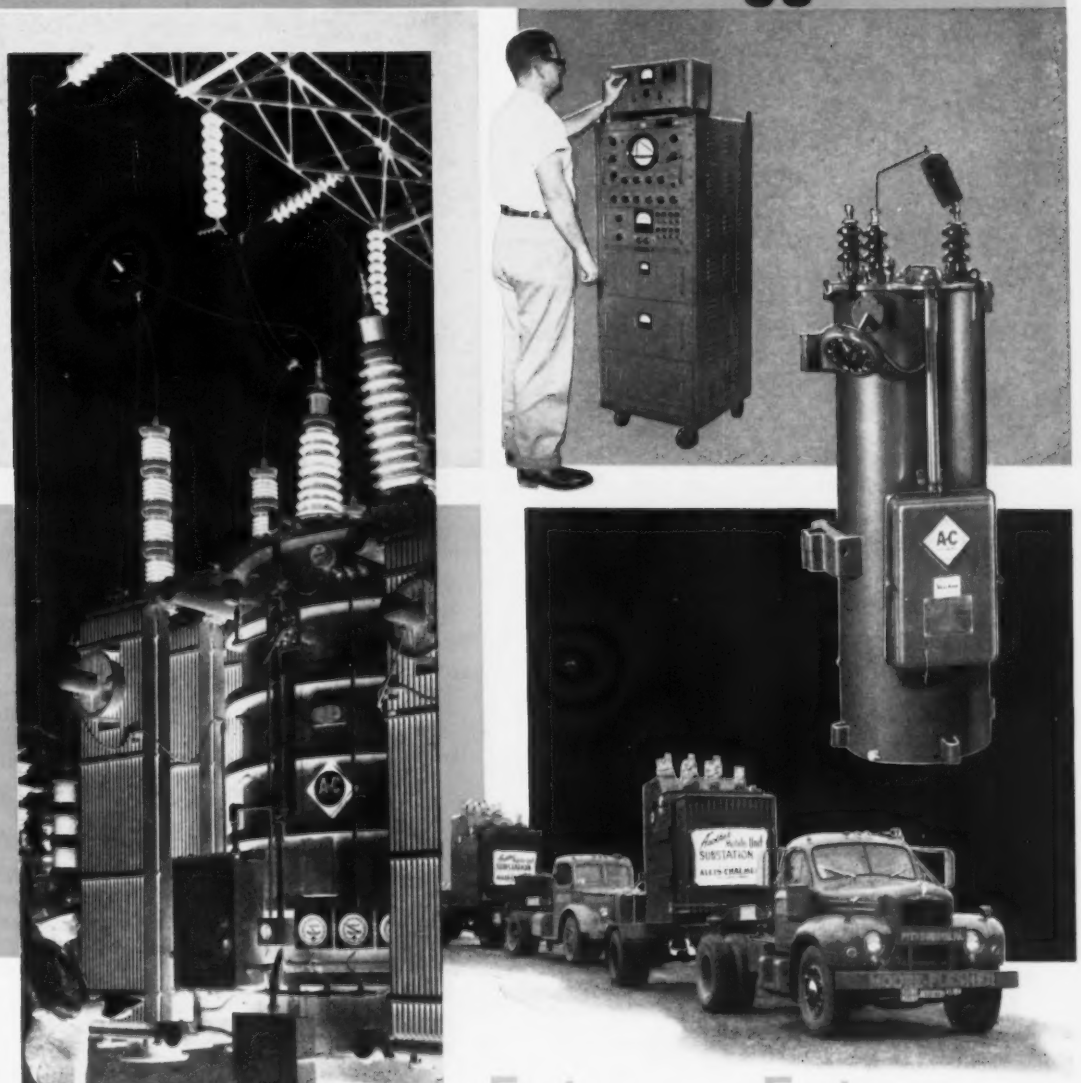
Reports on negotiations and labor relations in various parts of the West were also an important part of the two-day meeting.

## IES

Beverly A. Travis, consulting engineer and recently selected Electrical Man of the Year by the Puget Sound Electric League, and George Taylor, Day-Brite Co., St. Louis, president of IES, will be the honored persons at the 13th annual Pacific Northwest Regional Conference of the Illuminating Engineering Society to be held at Banff Springs Hotel, Alberta, May 26-29. Both will speak at the opening meeting. The technical program will consist of pa-

Well under way and going strong is the Electrical Construction Section of the Sacramento Valley Electrical League whose officers, taken at the April 8 meeting, are shown here. Seated are Vern Gil, Capitol Electric Co., president; Harry O'Laughlin, Sacramento Municipal Utility District, secretary. Standing are Tom Garvey, Incandescent Supply; Ray Gatejen, contractor; Bill Hagen, program chairman; and Delbert O'Connor, vice-chairman. Hanson Boyd, another director, was not present

ALLIS-CHALMERS modern line for '59




# Extras...Extras...

## Read all about them

It's the extras that make the difference in the electrical equipment field today! There's much standardization today, but there's still room for the designer's genius. There's still room for features resulting from research or field experience.

**While you're buying — update!** And to update — look for the extras. They make the difference.

*Some of the extras Allis-Chalmers offers are shown on the following pages. Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.*

**ALLIS-CHALMERS** A-C

A-5908 E

*For phone number of closest representative see advertising index in back of book.*

**From regulator to lamp**

*. . . use cost-saving*

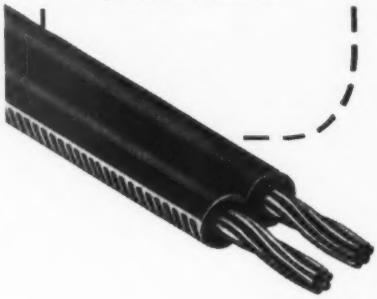
**SUPERIOR CABLES**

**Thermoplastic Series Lighting Cables**

- High resistance to earth acids and alkalis
- High resistance to sunlight, moisture, weather
- Small diameter, lightweight
- Easy to splice

**Figure 8 Pole & Bracket Cable**

- High resistance to abrasion, mechanical damage
- Does not deteriorate with age or weather
- Will not support combustion
- Flexible, strips clean, speeds installation



Performance and economy go hand in hand with SUPERIOR plastic insulated and jacketed cables.

All SUPERIOR CABLES are quality-engineered, precision manufactured and thoroughly tested.

From regulator to lamp . . . for low initial cost . . . for less maintenance cost . . . order SUPERIOR CABLES!

*For complete information and prices, write*

**SUPERIOR CABLES**

SUPERIOR CABLE CORPORATION

Hickory, North Carolina

3869

*For phone number of closest representative see advertising index in back of book.*


pers, both from Canadian and U. S. lighting experts. The "My Most Interesting Lighting Job" contest will be run off on the afternoon of May 27 and a floodlight demonstration is scheduled that evening. Technical meetings will be held Tuesday, May 28, morning, and Wednesday, May 29, until noon. The entertainment program includes trips to the scenic points in the very colorful Canadian Rockies. Co-chairmen of the conference committees are R. C. B. Jarvis of the Edmonton Chapter and Don Frost of the Chinook Chapter in Canada.

## IES

East Bay Section, Illuminating Engineering Society, plans to walk even before crawling in applying for section status as it splinters off of the Golden Gate Section to form a new chapter for the Oakland side of San Francisco Bay. Grant Radford, PG and E, has been appointed temporary chairman; Leonard Komar, Sylvania Electric Products, vice-chairman; Walker Brown, Weld-Rite Co., secretary; and Claude Parker, PG and E, treasurer. On the board of managers named were H. H. Robison, Northern California Electrical Bureau; Preston Jones, Prescolite Co.; Romaine Myers, consulting engineer. Some 60 members of the Golden Gate Section are expected to belong to the new East Bay Section. Plans are being made to receive the charter at the National Technical Conference in San Francisco in September.

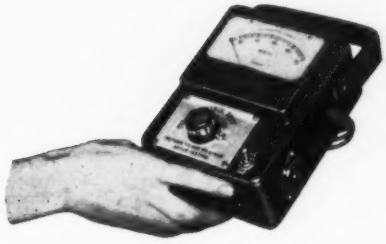
**East Bay Section, IES, officers anticipating a charter: Walker Brown, Weld-Rite Co., secretary; Grant Radford, PG and E, chairman; Leonard Komar, Sylvania, vice-chairman; already elected and awaiting official confirmation**

ALLIS-CHALMERS modern line for '59

## . . . simpler regulator control

- Provides more accurate settings
- Saves operator's time
- Eliminates customer complaints

Now when you adjust or test voltage level and band width there's no need to change customer voltage. No more customer complaints of high or low voltage. With *Caliband* control the job is simpler than ever before. Adjusting a single knob is all it takes . . . operator's time for accurate settings is greatly reduced.



### CALIBAND control demonstrated

*Caliband* control is so simple it can be demonstrated and explained at your desk with an actual unit in a small portable kit. Contact your nearby A-C office for a demonstration, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

*Caliband* is an Allis-Chalmers trademark.

**ALLIS-CHALMERS**
*Originators of ⅝% Step Regulators*
A-5912

*For phone number of closest representative see advertising index in back of book.*

Family get-together of Contra Costa County Branch, NECA. Andy Maser is chairman

## NECA

A new pattern of meetings has been instituted at the Contra Costa Branch of the Northern California Chapter, NECA, at its office, 1235 Boulevard Way, Walnut Creek, by Andy Maser, branch chairman, and Laurence Rodgers, assistant manager for the area.

Being located in a new building that has a restaurant nearby, the meal is catered. The members meet there on a more social and friendly basis. Their meeting room is quieter and a family feeling is engendered. The group is working on a number of programs, particularly of value to the county, including journeyman's retraining, apprenticeship, school inspection, administration of the industry fund for promotion and a credit report system.

► Puget Sound Chapter of NISA is conducting a management course in a series of three lectures by **Dr. Newel W. Comish,** associate professor of marketing, University of Washington.

## IAEL

When the International Association of Electrical Leagues holds its 1959 conference in San Diego Aug. 11-14 the host, the Bureau of Home Appliances of San Diego County, plans to offer those who come from the electric leagues and bureaus throughout the country an entertainment program to make it a real vacation. Meetings will be held at El Cortez Hotel where the new "Travolator" or conveyor to its new addition was dedicated in April. One feature will be a visit to Stinson Aircraft to hear about and see the Charles Townabout electric car being manufactured there. J. Clark Chamberlain has sent all of the IAEL members a choice of attractions from which to make a personal selection.

Contestants in the My Most Interesting Lighting Job contest of the Golden Gate Section, IES. Left to right, Warren Smith, Smith Electric Co., second prize; R. L. Sawyier Jr., PG and E, first prize residential; Jerry Ets-Hokin, Ets-Hokin & Galvin; Charles Kreiger, consulting engineer, third prize; and Lloyd Dehrer, consulting engineer, Buonaccorsi & Murray, first prize commercial

# Market Development

## NCEB Officers

Officers of the Northern California Electrical Bureau for 1959, elected at a recent meeting in the bureau's headquarters at 1355 Market St., San Francisco, are: president, Stuart D. Paine, Thompson & Holmes Ltd. president; vice-president, P. L. Henry, Leo J. Meyberg Co. vice-president; secretary, O. R. Doerr, PG and E vice-president in charge of sales; treasurer, Henry A. Adams, Western Merchandise Mart general manager; executive committee chairman, John S. C. Ross, PG and E manager of residential sales.

Paine

Paine, who succeeds Charles W. Goodwin Jr., G-E Supply, as president of the bureau, has been with Thompson & Holmes, independent appliance distributor, since 1917.

Other members of the executive committee and chairmen of the various sections are: Ernest G. Kramm, Northern California Chapter, NE-

# Meetings Calendar—1959

**MAY**

6-8—*Institute of Radio Engineers,* regional conference and trade show, University of New Mexico, Albuquerque.

11-12—*Illuminating Engineering Society,* Intermountain region conference, Hotel Continental, Denver.

18-20—*NELPA,* Business Development Section, Advertising and Public Relations Committee, Rate Research Committee, Multnomah Hotel, Portland.

20-22—*PCEA,* annual convention, Hotel Fairmont, San Francisco.

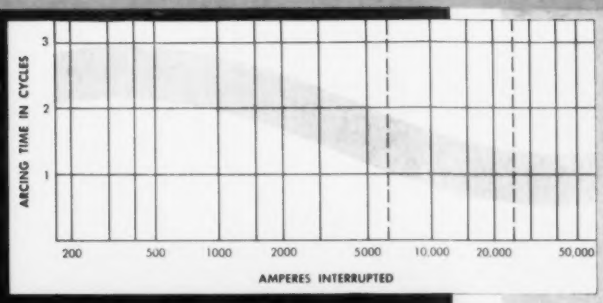
24-27—*AIEE-ISA-ARS-IAS,* Telemetering Conference, Brown Palace and Cosmopolitan Hotel, Denver.

25—*Northwest Public Power Assn.,* annual membership meeting, Hotel Olympic, Seattle.

26-29—*IES,* Pacific Northwest region conference, Banff Springs Hotel, Banff, Alberta, Canada.

26-28—*American Public Power Assn.,* annual national convention, Hotel Olympic, Seattle.

# ALLIS-CHALMERS modern line for '59




Graph shows short arcing times.

**Ratings:** 23 kv to 46 kv
500,000 kva and
1,500,000 kva

**Low carbon production of new interrupter is illustrated by bottles. Samples taken at intervals from two units after same number of fault switching operations.**

## NEW interrupter cuts oil contamination

Reduced arcing time . . . less carbon . . . characterize new interrupting device for Allis-Chalmers frame-mounted breakers.

Contamination due to circuit interruption is greatly reduced . . . dielectric strength is extended.

Tests consisted of fault switching operations at current levels of 200 to 40,000 amperes.

### Five-cycle operation

This new interrupting device with its matching high-speed *Pneu-Draulic* operator provides fast operation: closing, reclosing and interruption.

*For complete details on Allis-Chalmers frame-type breakers, contact your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.*

*Pneu-Draulic* is an Allis-Chalmers trademark.

A-5916-E

**ALLIS-CHALMERS**

*For phone number of closest representative see advertising index in back of book.*

# Jet Line Gun Saves Hours!

***New fast safe system for wiring conduit eliminates snaking!***

**DON'T** use a steel fish tape and spend many dangerous hours snaking it through a conduit.

Don't snake it . . . jet propel it! That's the Jet Line system in a nutshell.

A small, jet-propelled cartridge does the trick! Launched by the Jet Line Gun, it twists around ells and bends up and down as it lays a strong nylon line in the conduit in seconds. Using the nylon line, draw a foot-marked Jet Line polyethylene rope through and you're ready to pull wire.

Safe, sure and fast, the Jet Line system saves wire, money and time!

Thousands of contractors use the Jet Line Gun. Order your Jet Line Gun Kit TODAY!

**DO** use a Jet Line Gun and safely jet-propel a nylon line through the conduit in seconds!

**THE JET LINE SYSTEM IS SAFE!**

- No powder charge — No explosion
- Both nylon line and polyethylene rope are non-conductors.

**THE JET LINE GUN** was invented by experienced electricians for use in rigid and flexible steel conduits, underfloor and underground ducts and cavity wiring structures. For runs up to 300 ft. . . . double this distance when launched into both ends of the run.

*Ask your distributor or write*

*Pat. Pending on Method and Apparatus*

Jet Line Gun Company

730 Seigle Ave., Charlotte, N. C.

3758

*Copyright 1958 Jet Line Gun Co.*

*For phone number of closest representative see advertising index in back of book.*


CA, chairman, wiring section; Donald D. Scarff, G-E Lamp Division, chairman, lighting section; P. L. Henry, Leo J. Meyberg Co., chairman, radio and television section; M. B. Sauer, Westinghouse Appliance Sales, chairman, appliance section; C. W. Leihy, ELECTRICAL WEST, chairman, educational section; LeRoy Herbert, Oster Mfg. Co., chairman, electrical housewares section; members-at-large: G. L. Call, Graybar Electric Co.; W. F. Cronin, Frigidaire Sales; Frank Falge, Live Better Electrically Project.

## McKinley to Head Total Use Program

Appointment of J. G. McKinley to head up the Westinghouse Total Electric Home program in the Pacific Coast region was announced last month by Vice-president Walter J. Maytham.

McKinley

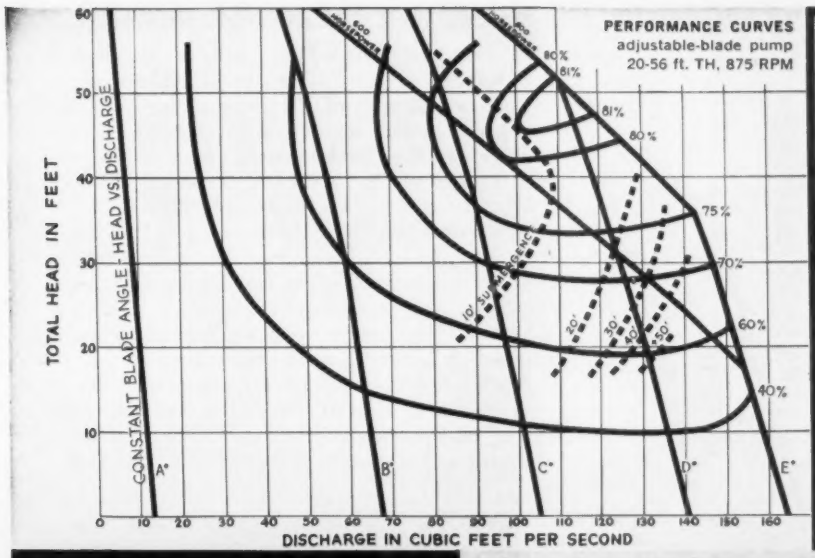
McKinley returns to the West from Mansfield, Ohio, to coordinate the support of utilities and builders for this new electric living program, in which about $2.5 million will be spent during 1959 to promote the "total electric" concept. His headquarters will be in San Francisco.

He joined Westinghouse in 1949 as contract sales manager for Wesco in San Francisco. Four years later, he was named Pacific Coast regional sales manager, contract sales, and in 1956 was transferred to Mansfield Appliance Division headquarters where he was given responsibility for sales to the builder and apartment house market.

Before joining Westinghouse, McKinley served nine years with Coast Counties Gas & Electric Co.

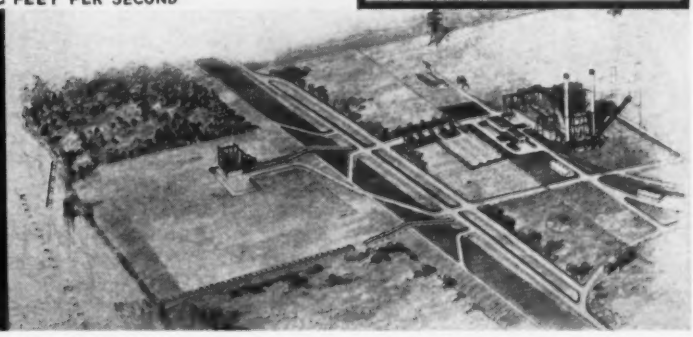
► To promote sales of its recently added line of Kitchen Aid dishwashers **Sues, Young & Brown,** Los Angeles distributor, is sponsoring all-expense trips to Las Vegas for dealers who sell a dozen or more washers during the period from April 1 through May 29. Qualifying dealers will also be provided with a gambling stake.

► **John F. Conger** has been appointed Denver branch manager for Admiral Corp. He has been manager of the Admiral branch in Oklahoma City. At one time he headed Dahl Conger Inc., Denver.




Performance curves of the A-C adjustable-blade axial flow pumps for Willow Glen illustrate their extreme flexibility. Pump operation is not restricted to a single head-discharge curve as is the case with fixed-blade pumps, but provides any discharge and head combination within the limits of motor horsepower and proper submergence.

Stone & Webster Engineering Corp. is designing and constructing the Willow Glen Plant at St. Gabriel, La. on the Mississippi River for Gulf States Utilities Co.



# Flexibility and efficiency make Allis-Chalmers adjustable-blade pumps choice for Willow Glen

Two 30-inch Allis-Chalmers adjustable-blade axial flow pumps will be installed to provide condenser water for Unit #1 at the new Willow Glen Power Station. To meet requirements at minimum river level, with water temperatures that vary between 39°F and 90°F, the pumps are designed to deliver a total of 76,000 gpm against a 54-foot total head.

Extreme variation of suction pool elevation and the flexible condenser operation required for this station made adjustable-blade pumps the logical and economical choice. A-C adjustable-blade pumps attain relatively high efficiencies over a wide discharge and head range. This is accomplished by varying the pitch of the impeller blades while the pump is operating at constant speed. This adjustability keeps pumping costs at a minimum by combining low starting torque with high average efficiency.

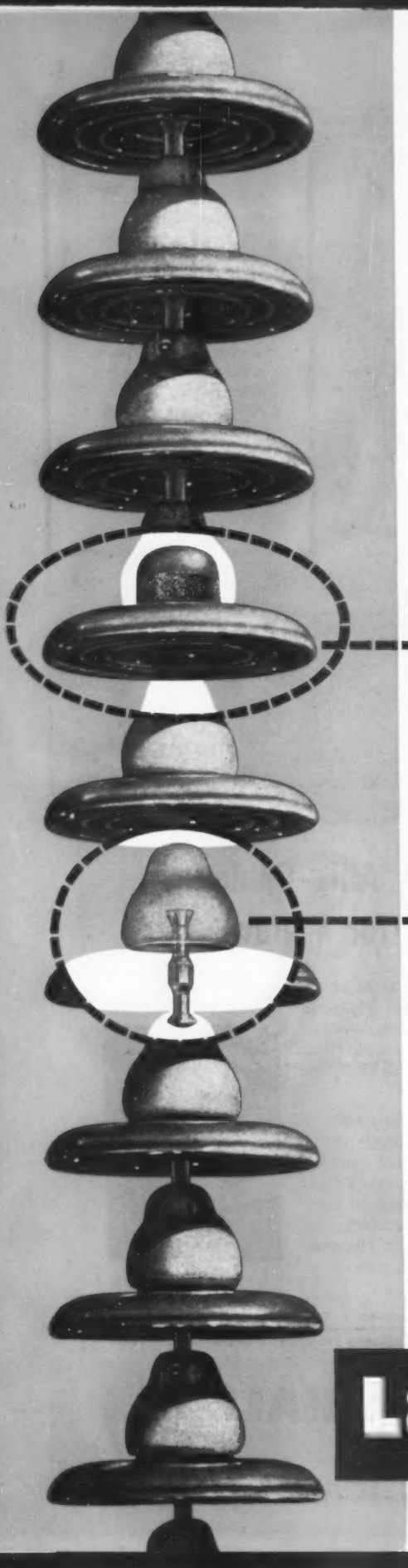
Pump Bulletin 165 will give you complete information on high capacity axial flow pumps. To get your copy, write to Allis-Chalmers Manufacturing Co., Hydraulic Division, York, Penna.

Hydraulic Division — RESEARCH | DESIGN | HYDRODYNAMICS | ENGINEERING | FABRICATION

Hydraulic Turbines & Accessories • Pumps • Liquid Heaters
Rotovalves • Ball Valves • Butterfly Valves • Free-Discharge Valves

A-C ALLIS-CHALMERS

*For phone number of closest representative see advertising index in back of book.*



## GOT AN INSULATOR CORROSION PROBLEM?

Competent transmission system design calls for selection of components matched to each other in useful-life-expectancy. It often is the case, in areas of salt spray and/or industrial contamination, that rusting out of suspension insulators may be the first sign of a line "wearing out"—years before conductors or structures are in need of replacement. For such lines now being constructed or planned, the need for high-line maintenance or future reinsulation—and its high cost in skilled labor, transportation, and materials—can be avoided. Lapp suspension insulators are available, on specification, with cap and bolt components in a variety of corrosion-resistant alloys. We now have a lot of test data and installation records to help us, and you, to predict performance of these metal parts over periods of varying conditions of weather, concentration of corrosive action, prevalence of contamination, leakage currents and corona. Ask your Lapp representative about it—or write direct to us.

## the porcelain is "forever"

Lapp vacuum process porcelain, with balanced compression-glaze "fit," has been proved—over millions of pieces, in thousands of shapes—the "most dependable insulation material on any system." Suspension discs are offered in standard (15,000-lb.) strength, high (25,000-lb.) strength, and heavy-duty shells. Fog-type units in same standard and high strength ratings, for either 5¾" or 6½" spacing.

## the hardware by specification

**FORGED STEEL** hot-dip galvanized, standard for caps and bolts. Smooth contours and uniformity of galvanizing have improved corrosion resistance over earlier insulators.

**MALLEABLE IRON** for caps only. Hot-dip galvanized, it is approximately equivalent to standard forged steel in corrosion resistance.

**LOW-ALLOY STEEL** hot-dip galvanized. For caps and bolts. Offers four to six times greater resistance to corrosion than forged steel. Nominal price premium.

**DUCTILE NI-RESIST** for caps only. Considerably lower in cost than stainless, is second only to stainless in resistance to most forms of atmospheric corrosion.

**STAINLESS STEEL** has highest resistance to corrosion of any material. Used principally for bolts, can be furnished for caps where severity of operating conditions justify the cost.

**ALUMINUM-SILICON-BRONZE** for caps and bolts under special chemical atmospheres where its resistance exceeds that of stainless.

**Lapp**

Lapp Insulator Co., Inc., LeRoy, New York.

*For phone number of closest representative see advertising index in back of book.*

## Use-Value Show Held

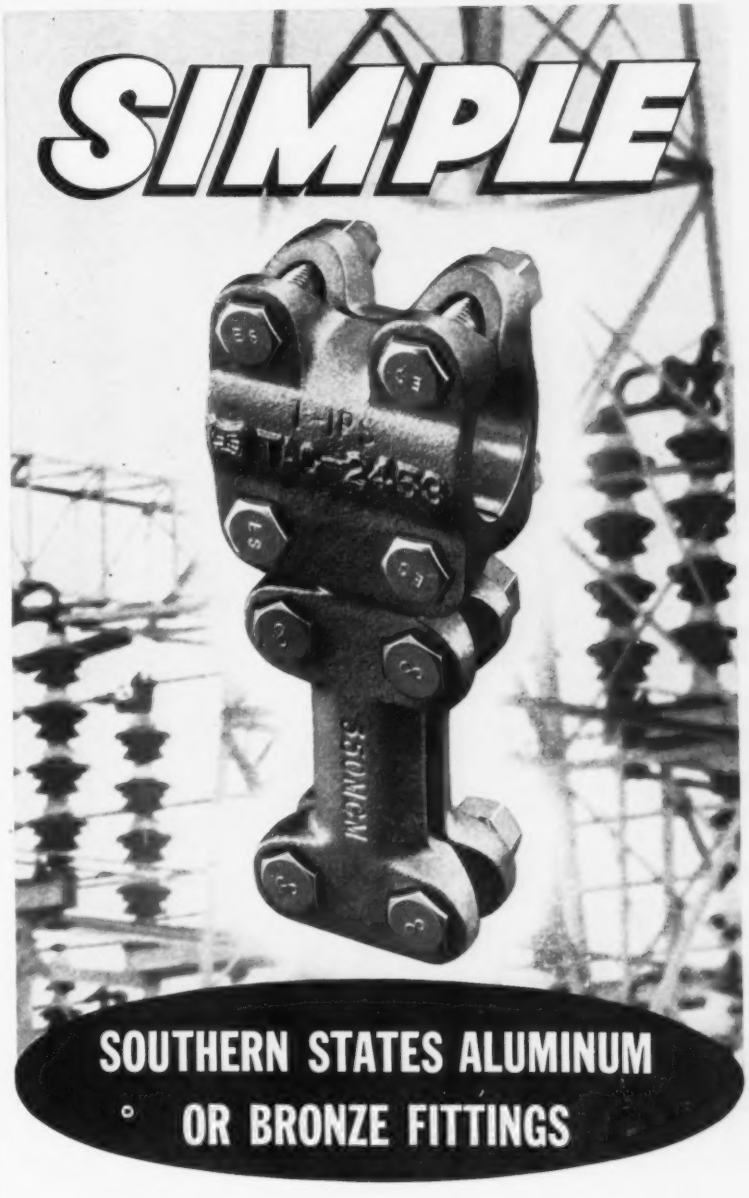
Hotpoint presented its 1959 Custom Trend appliances to teachers and home economists in business at regional Use-Value meetings in the West. Typical was the session at San Francisco's Fairmont Hotel, where Frances Michael, director of Hotpoint's Home Economics Institute, Clara Sherburne, West Coast field home economist, and Carol Sutherland of the Chicago staff presented a program that was both entertaining and instructive.

Taking the theme "Electric Living, A Family Affair," the three home economists wove the care and use story into entertaining skits—wash and wear fabrics were modeled; the refrigerator-freezer story was told by an "Eskimo housewife" in the new family frontier; the mystery of dishwashers that broke fine crystal and committed other crimes was solved in "Jack Webb" style; ranges from the first one, five million families ago, to present models were shown live and through pictures with a commentary in diary form.

Economists who attended the five-hour program got a briefing in Hotpoint appliances and took away some homemaking hints. Scripts of the program, with recipes, types of fabrics shown in the washer presentation and other useful information were given to each guest.

► The California Branch of the American Federation of Women's Clubs presented an award to General Electric for its "discriminating presentation of commercial messages" on G-E Theater. **Bill Kite**, advertising and sales promotion manager for the Apparatus Sales Division in Los Angeles, accepted the award on behalf of G-E.

► Although it's now pillow cases instead of towels, **Graybar's Operation Avalanche** at Los Angeles is still netting prospects and sales for Norge home laundry equipment. Seventy-two demonstrations over a six-week period averaged sales of five units each. Customers were given new pillow cases in exchange for their old but clean cases, which were torn in half for the demonstration. One half was washed and dried on the spot, then compared with the half washed in the customer's old machine. Towels, which launched the campaign in late 1958, were discontinued because they took longer to dry than the pillow cases.

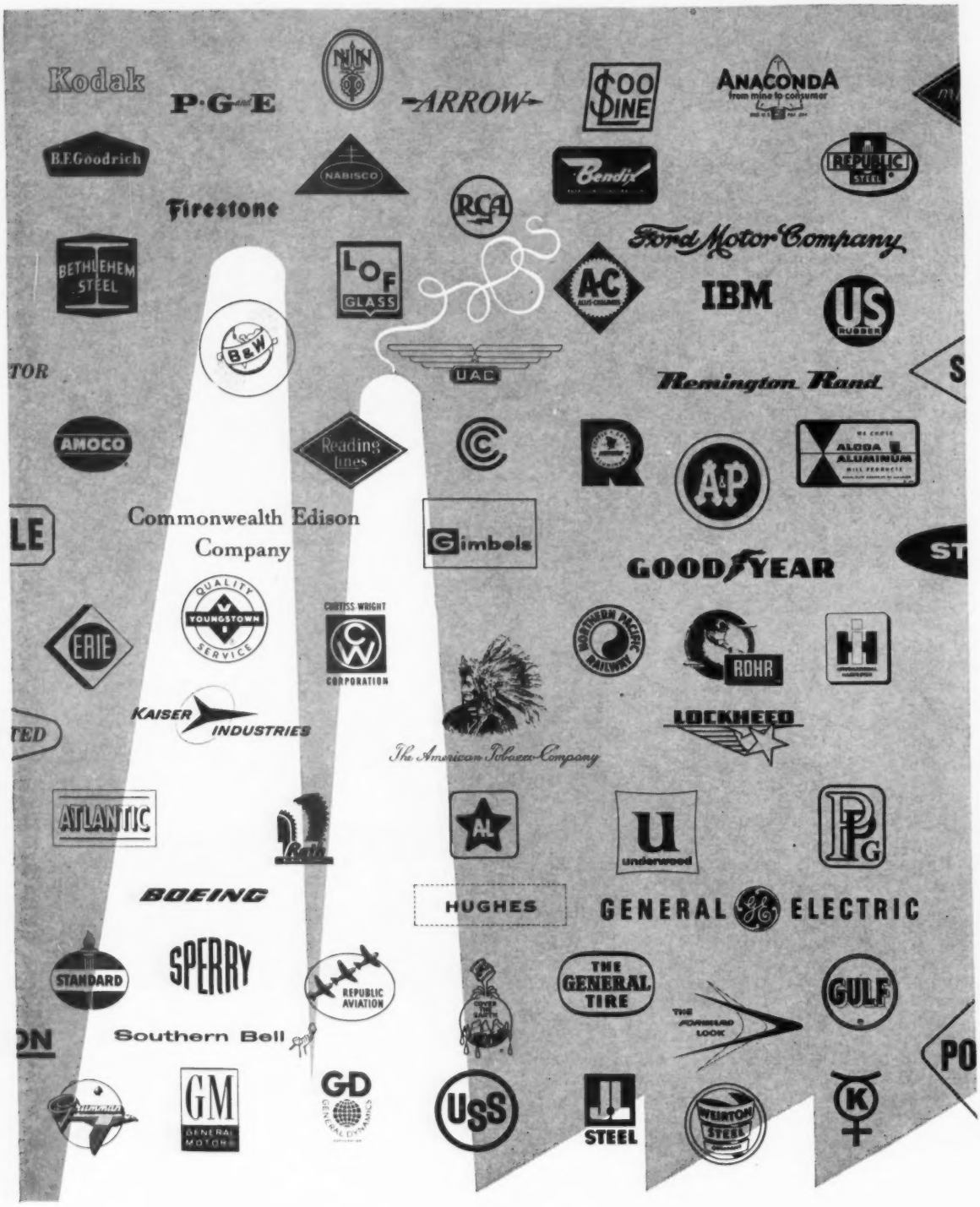



The clean, simple lines of Southern States connectors didn't just happen. The recessed hexagonal bolt heads, or proven alloys, didn't either. Nor did the resultant over-all strength, ruggedness, and durability of these high-quality fittings. All of those characteristics, which you look for in connectors, are the result of careful engineering, backed by more than 25 years experience in producing these products — from drawing board, to foundry, to you.

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

*For phone number of closest representative see advertising index in back of book.*



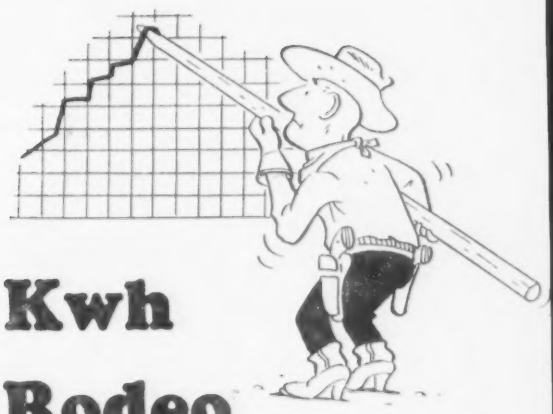

# LEADING AMERICAN INDUSTRIES

*offer their employees the Payroll Savings Plan for U. S. Savings Bonds*

These are but a few of the leading firms which support the Savings Bonds program with more payroll savers than ever before in peacetime.

# Announcing

**The Third Annual Kilowatt-hour Contest**



# Electrical West's Kwh Load Forecasting Rodeo

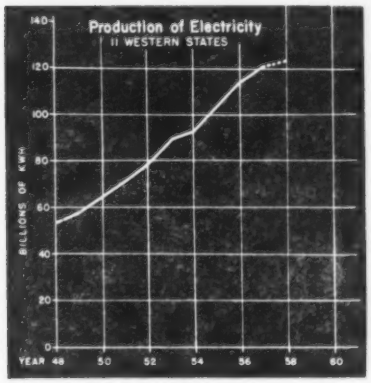
## A Chance To Put Your Brand on a $500 Block of Stock of a Western Utility

***The Object***—To forecast the total kilowatt-hour output of the power stations in the 11 Western states for the year 1959, giving reasons for the estimate in 25 words or less. Federal Power Commission figures of kilowatt-hour output will be the final authority.

***The Contestants***—Any person employed in any segment of the electrical industry in the 12 Western states or Hawaii may submit one entry in the contest—using the attached postcard or a reasonable facsimile thereof. Entries must be postmarked not later than June 30, 1959. Employees of the McGraw-Hill company and its subsidiaries are ineligible to participate.

***The Prize***—ELECTRICAL WEST will award the winner, who comes closest to the actual official FPC kwh output figure, $500 worth of common stock in one of the electric companies serving an area of the 12 Western states. The electric utility whose common stock will be the prize will be determined by a drawing held at the annual Pacific Coast Electrical Assn. convention in San Francisco, May 20-22, 1959. Stock representing the prize will be purchased immediately after the drawing and held in escrow with any accrued dividends until the winner has been determined. In case of ties, the prize will be divided equally between those submitting the winning figure.

***A Hint***—In 1958 the official kilowatt-hour output figure for the 11 Western states was 122,819,372,000 kwh as reported by FPC.




***It's Fun—It's a game of skill***—**and a test of your optimism about Western growth. Calculate what this figure will be for 1959! It costs nothing to enter the contest. Just send in your estimate on the attached card, by letter or other postcard.**

**To ELECTRICAL WEST's Kilowatt-hour Contest Editor**

**Here's My Forecast**

The annual kilowatt-hour output for the 11 Western states for the year 1959 will be ..... kwh.

Here's why (in 25 words or less). .....

.....

.....

.....

Name .....

Title or job .....

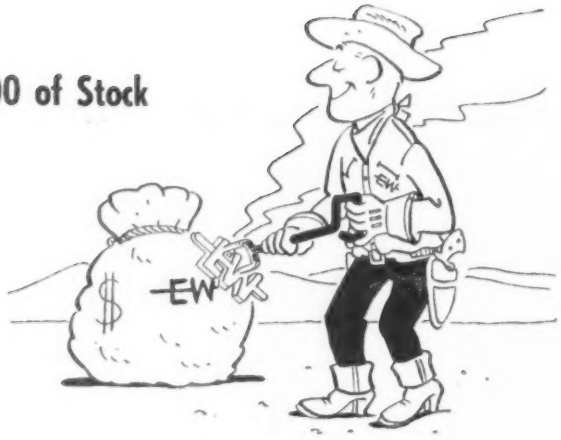
Company .....

Address .....

City ..... State .....

**(Return before June 30, 1959)**

Put *Your* Brand on $500 of Stock




## *Use this Card to Enter*

# ELECTRICAL WEST'S

# —Kilowatt-Hour Rodeo—

**See preceding page for details**

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

**BUSINESS REPLY MAIL**
First Class Permit No. 1803, San Francisco, Calif.

**Electrical West's Kilowatt-hour Rodeo**
**68 Post Street**
**San Francisco 4**
**California**

# For the BEST POLE LINE—*specify*

# HUBBARD HARDWARE

## from arm to anchor!

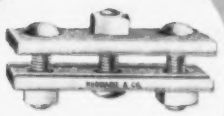
When it comes to pole line hardware . . . look to Hubbard for all your needs. From this one source . . . the world's largest manufacturer of pole line hardware . . . you get thoroughly dependable products wherever you are.

Continuous research by Hubbard Engineers . . . responsible for the high standards of quality and design of Hubbard Hardware . . . has now been greatly accelerated by the unexcelled facilities of the new Hubbard Electrical Research Laboratory—to bring you the finest pole line hardware in the industry.

Next time you need pole line hardware, call your Hubbard Distributor. There is one near you.

GUY HOOK

STRAIN PLATE



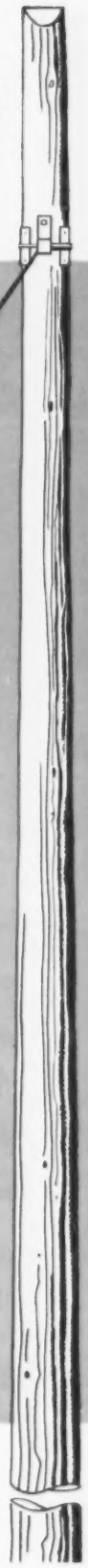
GUY CLAMP

SERVISLEEV

GUY PROTECTOR

STEELWING ANCHOR

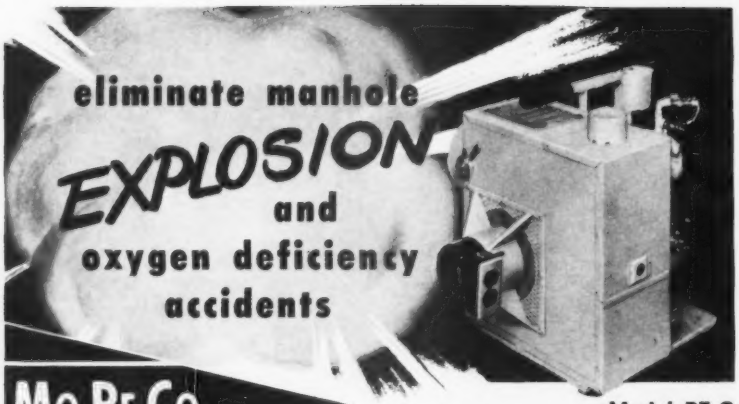
The items illustrated are available in a full range of sizes.



HUBBARD

AND COMPANY · 200 SOUTH MICHIGAN AVENUE · CHICAGO 4, ILLINOIS

*For phone number of closest representative see advertising index in back of book.*




MO PE CO

Model PE-G

VENTILATING HEATERS

give you fresh air • heated fresh air • light ...in one portable unit!

- 300 to 800 cfm fresh air
- 10° to 96° temperature rise
- 300 watt DC generator
- Weighs only 78 pounds
- Propane or Butane fuel
- Safe fresh air blown into the manhole at all times.

Order through your favorite distributor

Write or call
MORRISON-PELSUE CO.
Denver, Colorado
2256 So. Delaware St. RAce 2-2834

They both know the best buy in tape...

ACCURATE TAPES
FRICTION .... RUBBER .... PLASTIC

Send today for our most recent bulletin describing details.

ACCURATE MANUFACTURING COMPANY
GARFIELD, NEW JERSEY

*For phone number of closest representative see advertising index in back of book.*


## People

► **Thomas A. Lang,** one of Australia's outstanding engineers and an authority on hydroelectric development, has joined Bechtel Corp. as an executive engineer in the power and industrial division. Lang had been associate commissioner of Snowy Mountains Hydroelectric Authority, New South Wales, Australia. He was recently named a Commander of the Most Excellent Order of the British Empire by Queen Elizabeth for his contributions to the science and practice of engineering and the development of Australian water resources.

Lang

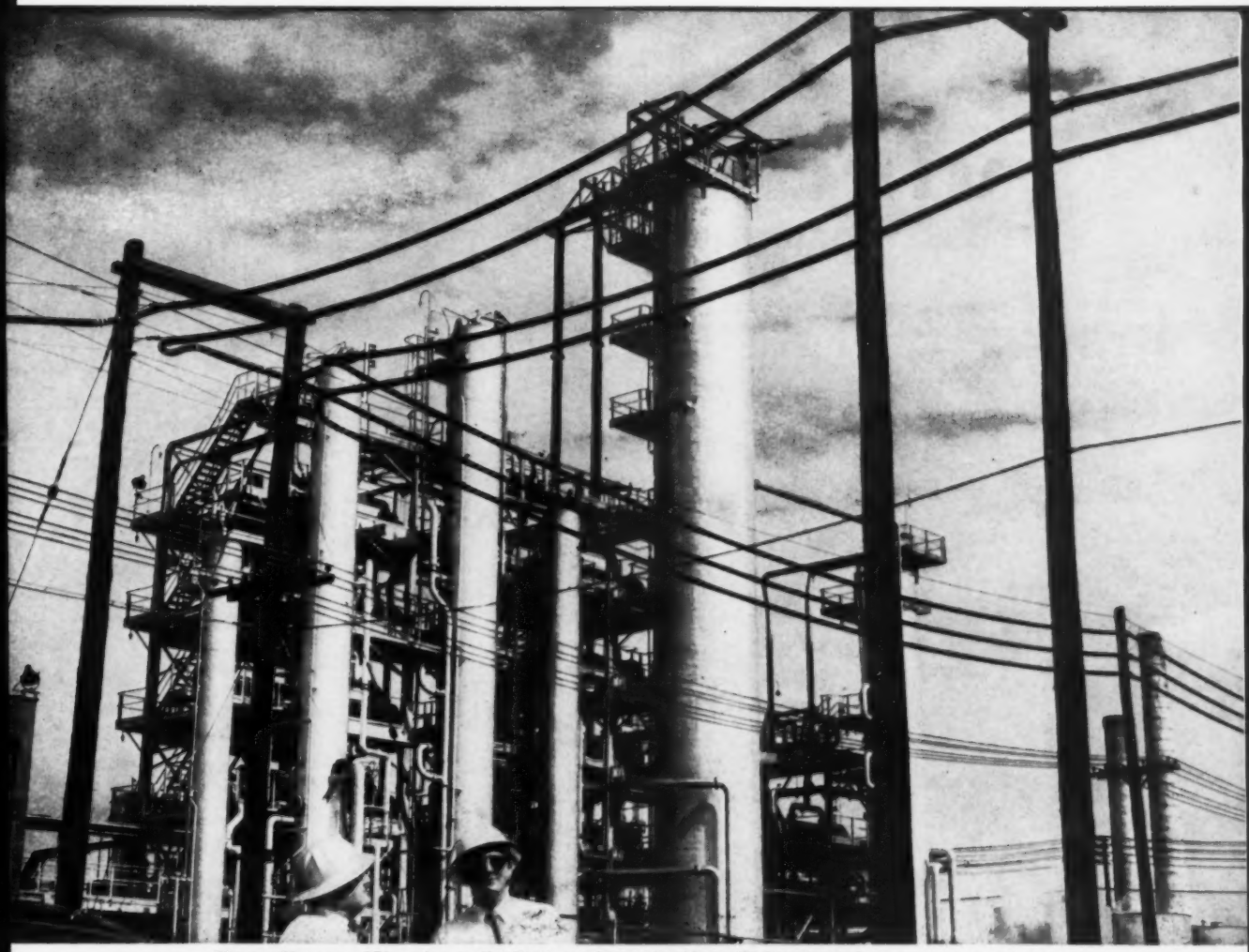
McCaffrey

Shaad

► **James E. McCaffrey,** general manager and chief engineer of Sacramento Municipal Utility District, has resigned effective June 1 because of ill health. **Paul E. Shaad,** assistant general manager, was appointed by the directors to succeed McCaffrey. Shaad has been with SMUD since July 1945. McCaffrey has been general manager for the past 20 years.

► **Lyman J. Harris** is the new Northwest power manager for Aluminum Co. of America. He succeeds the late **W. E. "Bob" Lawton,** who died in January. Harris is a member of the American Institute of Electrical Engineers, and has been author and co-author of several AIEE conference papers on electrical rectifiers and their associated equipment. Prior to the new appointment, he was power manager of Alcoa's Rockdale, Tex., works.

Harris



Okonex-Okoprene 15kv primary distribution cables solve Magnolia Petroleum Company's space problem and climate problem (wet and salty atmosphere) and provide greater safety in its Beaumont refinery.

# Magnolia Refinery improves voltage regulation, beats humidity with Okonex-Okoprene cables

The giant 1,500-acre Magnolia Petroleum Company refinery, located on the broad Gulf Coast Plain, generates and uses 900,000 kilowatt hours a day, more than its neighboring city of Beaumont, Texas. A cable breakdown here could cause costly damage to equipment and the material in process (more than 400 oil products are manufactured). The entire cable system must serve Magnolia's round-the-clock operation without interruption in the face of the high moisture-saline content of the air, plus the chemicals and intense heat used at many of the processing units.

For the 15kv primary aerial loop distribution system, Magnolia's engineers selected shielded Okonex-Okoprene cables. These butyl-base insulated, neoprene-sheathed constructions saved space, eliminated safety problems and provided improved voltage regulation far superior to previous open wire constructions and other insulated cable constructions studied. In addition, their excellent moisture, heat and corrosion resistance were important assurances of maximum service life.

Okonex-Okoprene, in 3,000 to 15,000 volt constructions, was also used for trunk feeders to and from substations, tie lines and motor leads installed both aerially and underground.

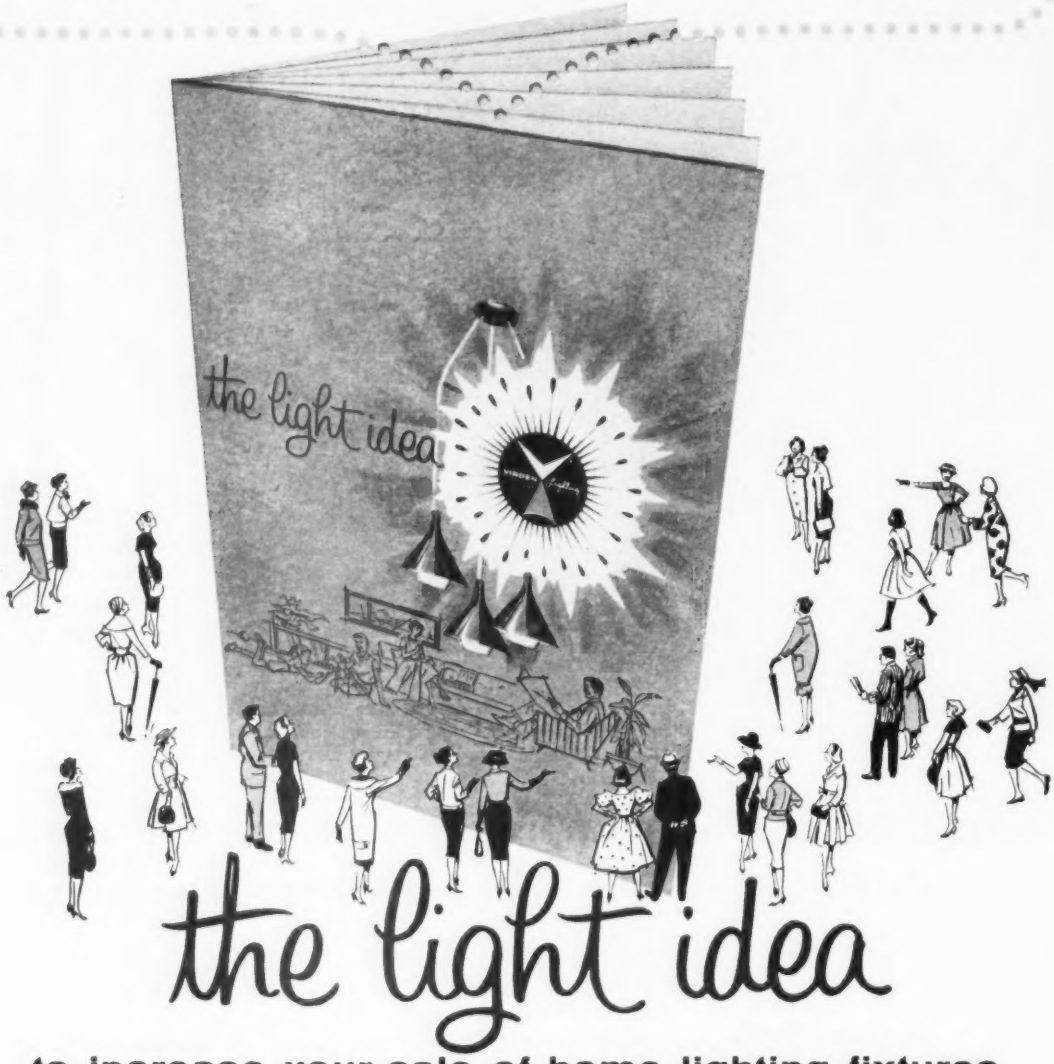
To help you specify the optimum cable for your important power and control cable needs, contact your Okonite representative or write for the free Bulletin WE-1117, "How to choose insulated cable," to The Okonite Company, Passaic, New Jersey.

*where there's electrical power . . . there's* **OKONITE CABLE**

6339

*For phone number of closest representative see advertising index in back of book.*

# virden announces a new concept in home lighting




# the light idea

## to increase your sale of home lighting fixtures

Now you can sell lighting . . . not just fixtures! Match your customers' mode of living with the *right lighting* for every occasion . . . and gain more sales . . . more profits.

"the light idea" by Virden makes it possible. It matches lighting to today's living patterns . . . *creates the right lighting mood* for every occasion . . . from overall illumination through accent and protective lighting.

Our new 52-page, full color catalog explains "the light idea" in detail, shows and tells how to achieve it. In addition, it shows the complete new Virden line . . . new pulldowns, chandeliers, bullets . . . outdoor and garden lighting . . . in every decorator style. Truly the most brilliant collection in the industry.

Ask your Virden distributor for your copy today. You'll find him listed in the Yellow Pages under "Lighting." Or write to Virden Lighting, Dept. ELW, 5209 Euclid Avenue, Cleveland 3, Ohio.

Find It Fast In The Yellow Pages

# virden LIGHTING

A Division of the John C. Virden Company • Cleveland 3, Ohio • In Canada, John C. Virden, Ltd., Toronto 16, Ontario

*For phone number of closest representative see advertising index in back of book.*

L. T. "Don" Owen has been appointed Mountain territory district sales manager for Hubbard & Co., and moves to Salt Lake City. Owen will also serve as district sales manager of Electrical Engineers Equipment Co. of Melrose Park, Ill. Standing, from the left, are William Featherstone, Ray Waggoner, West Coast vice-president, and R. F. Pinson. Featherstone and Pinson are in the Hubbard West Coast organization

Thompson

Murray

► **Virgil N. Thompson** has been named manager of Washington Water Power Co.'s Palouse division, to succeed the late George A. Whitely. **John B. Murray** will succeed Thompson as manager of the Big Bend division.

Summers

Schiffers

► **Carl J. Schiffers,** vice-president and assistant secretary of Hawaiian Electric Co., has been named administrative vice-president. **Richard L. Summers** was made a vice-president in addition to his duties as secretary.

► **Paul H. Leech** has been appointed Western editor of *Electrical World*, to succeed C. F. Hochgesang. Prior to joining the magazine's staff, Leech spent 11 years with General Electric and International G-E companies on utility and industrial heavy apparatus sales. A 1943 electrical engineering graduate of the University of Colorado, Leech began his engineering career in the G-E student course. Hochgesang is promoted to a new staff assignment with *Electrical World* in New York.

Leech

► **L. O. Calkins** has been appointed Western area sales manager for Fluor Corp. Ltd. In this position he will have authority and responsibility for all sales in the Western area, comprising roughly the Rocky Mountain and Pacific Coast states. He has been with Fluor since 1942, and has served as district sales manayer in Denver and Los Angeles.

Calkins

► **John J. Hayes,** former treasury manager for the Pacific Coast region of Westinghouse Electric Corp., has been named head of a new San Francisco office of Craig, Dunmire & Associates Inc., consulting management engineers. The management firm has been headquartered at Oakland for the past 10 years, and will continue to maintain its main offices in that city.

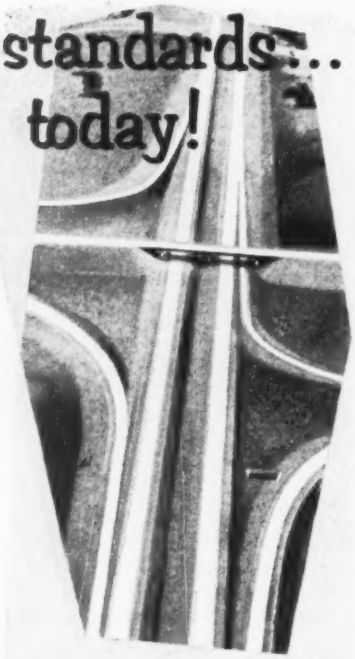
Hayes

► **Ralph Cutler** has been named a vice-president of Yuba Consolidated Industries Inc. and general manager of Southwest Welding and Manufacturing Division. He comes to the company from Kaiser Steel Corp., where he was manager of engineering and estimating for the fabricating division. Southwest Welding and Manufacturing Division does engineering, fabrication and field construction of heavy equipment for the atomic energy, power and hydroelectric industries.

Cutler

John Graham, 32-year veteran with Washington Water Power Co., has been named superintendent of the company's new 403,000-kw Noxon Rapids Dam on the Clark Fork River in western Montana. Graham, who has taken up residence at the dam, was superintendent at Long Lake Dam, on the Spokane River, before the move. WWP's Herbert Roehling, now at Long Lake, will go to Noxon as chief operator

tomorrow's standards... today!



The Ohio Turnpike is the newest link in a national chain of superhighways that will eventually tie East to West. The most modern concepts of traffic engineering are reflected in the construction of this magnificent road. What transformers are used for service and lighting? Marcus, of course!

Electrical contractors:
Amon Electric Co., Warren, Ohio
Peterson-Webster Electric Co.
Youngstown, Ohio

**Marcus TRANSFORMER CO., Inc.**
RAHWAY, NEW JERSEY

*"Mark of Quality"*

Representatives in Principal Cities

A COMPLETE LINE OF DRY TYPE AND LIQUID-FILLED TRANSFORMERS THRU 5000 KVA

for the LONG PULL use Y-ER EAS Wire Pulling Lubricant

*Only Y-ER EAS has all these features*

- Creamy, non-corrosive lubricant. Never greasy or messy.
- Prevents sticking or setting. Specially helpful on saddles and turns.
- Does not run back on cables.
- Never harmful to hands or clothing.
- Permanently non-harmful to cables or conduit.

*Write for descriptive booklet*

GIVES THE SLIP TO— Lead, Rubber, Braid or Synthetic Covered Cables

Representative:
Matzinger-Johnson Co.
1329 Willow St.
Los Angeles 13
Phone: Madison 4-8001

ELECTRO COMPOUND CO.
4148 W. 150th St., Cleveland 35, Ohio

**ELECTRICAL ENGINEER**
of exceptional experience
seeks
**WESTERN UTILITY**
placing emphasis on
***TRANSMISSION***

This man is now designing lines for a company noted for their creative work. He is happy in his associations but he knows from experience that a Utility with transmission work can use his ability with greater profit.

Continuously employed since 1941, except for radar training and service in World War II, in utility construction, sales, he is now in consulting.

He is serving several clients simultaneously designing lines up to 345kv, saving as much as $10,000 a mile with improved techniques. His ideas on tower and footing design are being adopted by a number of companies.

This man is far more interested in broadening the scope of his opportunity than he is in immediately commanding a top flight salary, because he has no fear but the evidence he can spread before the right company will place him in a strategic position for the future.

He is proud of the friends he has made, and can prove that he possesses all the essentials of a top grade organization man. His reasons for wishing to make a new connection will bear the closest scrutiny.

An interview may be readily arranged by writing to Box 302, Electrical West, San Francisco 4, Calif.

► **James P. Kneubuhl** has been appointed vice-president, utility sales, for Fluor Corp. Ltd. Kneubuhl is a 1938 graduate of Stanford University, and joined Fluor in 1941. He rose successively through positions of engineering and sales to vice-president of sales for Fluor's engineering and construction division.

Kneubuhl

► **Alex Boome,** who has been chief engineer with Skidmore Owings & Merrill for the past seven years, has started his own consulting service in Mountain View, Calif. Address is: 1155 N. San Antonio Rd.; telephone YOrkshire 7-4719. The new firm will soon have all engineering services. Boome is noted for his work on the Crown Zellerbach building in San Francisco and United Air Lines hanger and service facilities at San Francisco International Airport, as well as many other projects.

► **Vincent D. Kemp,** assistant resident engineer at Cougar Dam, has transferred from the Portland to the Seattle district of the Corps of Engineers. He is now chief of the contract administration branch for the Spokane area, with headquarters at Fairchild.

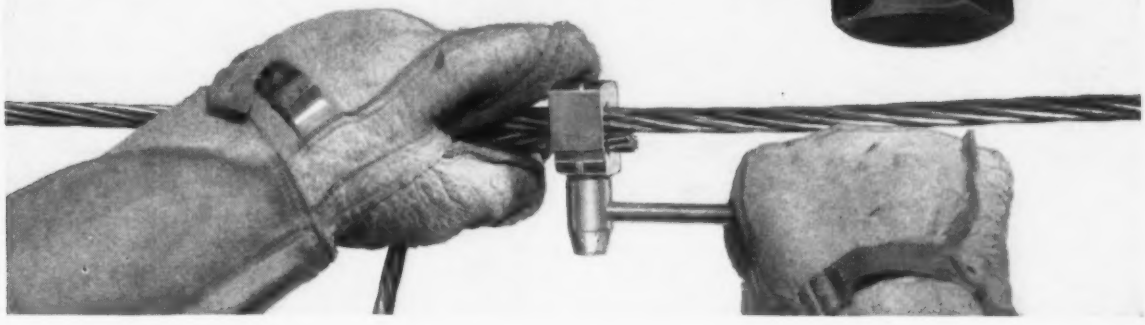
► **G. B. Sharkey** has been named regional manager in Los Angeles for Airtemp Division, Chrysler Corp. His area of responsibility is the entire West Coast.

► **Albert P. Bruch** has been reappointed to the Wyoming Public Service Commission, succeeding Richard J. Luman.

► **Richard B. Luce** has been named auditor of plant accounts for Pacific Gas and Electric Co., and **Leslie D. Coughran** has been appointed supervisor of the central accounting department. Coughan succeeds James M. Mayfield, who retired Dec. 31, and Luce succeeds the late Dewey J. Beaudet.

► **J. Scott Kay,** division electric engineer for Pacific Gas and Electric Co.'s San Jose division, has been promoted to senior distribution engineer in the company's San Francisco general office. **Robert Herzer** will succeed Kay in the San Jose position. He transfers from San Rafael.

# FIT RIGHT! WORK RIGHT!



## details make the difference

# FARGO "5000"

## CONNECTORS

Every detail in every Fargo "5000" series connector is right . . . "V" grooves assure perfect conductor alignment . . . greater compressive force . . . conductors completely enclosed . . . high strength . . . vibration proof . . . well rounded corners . . . flat surfaces for back up wrench . . . reusable . . . AND "ONE-PIECE," always threaded, no loose parts.

Fargo's "vise-type" designed connectors are easy to install . . . assure trouble free, long lasting electrical and mechanical connections . . . have a high efficiency for converting a torsional force into a compressive one . . . make a low resistance connection . . . are available from 8 sol. to 1,000 CM . . . *ask your Line Material Engineer for complete details.*

Distributed by
LINE MATERIAL INDUSTRIES
McGraw-Edison Company
Milwaukee, Wisconsin
In Canada, CANADIAN LINE MATERIALS, LTD., Toronto, Canada

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York

FARGO

*For phone number of closest representative see advertising index in back of book.*

HI-VOLTAGE
NEOPRENE COVERED
POWER CABLE
on hand for
immediate delivery

Large stock of shielded and non-shielded, grounded and ungrounded from 5,000v to 15,000v in wide range of types and sizes.

•

Also heavy duty power cable, multiple conductor control cable, flexible cords and cable.

Phone TEmplebar 2-3546
(OAKLAND)
and ask for "Scotty"
•
Name Your Size and Length
... We Ship Today!
•
Iron-clad guarantee of quality!
Write for current listing of sizes and specifications.

WC

WILLIAM CERESKE
company
electric wire and cable
1401 MIDDLE HARBOR ROAD
OAKLAND 20, CALIFORNIA
TEMPLEBAR 2-3546

# Manufacturers—Distributors

NATIONAL WINNER — James Gannon, Hotpoint district service manager at Fullerton, Calif., took the highest award in the company's national contest for improved customer service. Here he receives an electric wrist watch from W. G. McNeal of Chicago, as District Manager McWhinney, Los Angeles, looks on

► **Ed Nystrom** has been appointed national sales manager of the Electric Golf Cart Division of Stinson Aircraft Co., San Diego, which is developing the "Charles Townabout" electric car. Nystrom was a former president of the Bureau of Home Appliances and was active in the appliance industry. The new electric car was described at a recent meeting of the San Diego Electric Club by Deane L. Van Noy and Dr. C. Graves of the company.

► **Dwayne "Bud" Seely** has been transferred from the Portland office of Westinghouse, where he was street lighting specialist, to the company's new street lighting and assembly plant in San Lorenzo, Calif. He will be responsible for Pacific Coast street lighting sales.

► Names of two Portland firms have been changed. Leonard L. Minthorne Co., 0673 S. W. Taylors Ferry Road, has became **Roger M. Minthorne** Co. W. G. Ballantyne Co., 103 S. W. Front St., is now **Norman Rupp** Co. Both are manufacturers' representatives.

► G. M. Breidert Co., Los Angeles, will move into a 11,200-sq-ft facility in Pacoima in September. It plans to expand operations in the manufacture of air conditioning and ventilating parts and fans.

► **Pacific Electric Sales** Co., Portland, expects to open a warehouse in Seattle sometime this year. Expansion plans also call for posting a salesman in Boise, Idaho.

► **Electric Corp.** of California has been appointed as an authorized distributor for the **Automatic Switch Co.,** manufacturer of ASCO solenoid valves.

► **Jack Payne,** Los Angeles manufacturers' representative, has announced that he has taken on the Adalet (Cleveland) line of conduit and vapor-proof fixtures.

► **Bob Arnott,** Hotpoint sales counselor with Honolulu Electrical Products Co., received his weight in silver dollars at a dollar an ounce in the Mr. Hotpoint contest awards made at Las Vegas, Nev. He was first in his division.

**ARIZONA AGENCY**

**Nationally known manufacturer of electric wiring devices has opening in Arizona for experienced salesman calling on wholesalers. Send complete resume to BOX 301, Electrical West, 68 Post St., San Francisco 4, Calif.**

***NEEDED NOW!***

**ELECTRONIC ENGINEERS in ALASKA**

$5430 to $8810 per annum plus 25% cost-of-living allowance. Enjoy a career in the Federal Civil Service with paid annual and sick leave, retirement benefits, paid transportation to Alaska and return for leave purposes. Positions in Federal career service. Contact:

Federal Aviation Agency
P. O. Box 440, Anchorage, Alaska

*For phone number of closest representative see advertising index in back of book.*



► **Vernon R. Mick** has been appointed district sales engineer in the Seattle-Tacoma metropolitan area for **James L. Kearns** Co. Inc. of Portland. The Kearns company has appointed Richardson & Co., 510 Front St., Boise, Idaho, as its subagent for western Idaho.

► Southern States is now the majority stockholder of Dominion Cutout Co. Ltd. of Toronto. In making the announcement, **W. C. Mitchell,** executive vice-president of Southern States, said that both oranizations would continue to operate as usual; that long-established commercial and engineering ties would be strengthened.

► Maddox Sales Co. has opened a branch office in Phoenix, with **Frank E. Fredricksen** in charge, it was announced by **John H. Maddox.** Main office is at 914 E. Third St. in Los Angeles.

► A new booklet, **The Productive Nature of Wholesaling,** has been released by the National Association of Wholesalers, and is available from that group at 1001 Connecticut Ave., N.W., Washington 6, D.C.

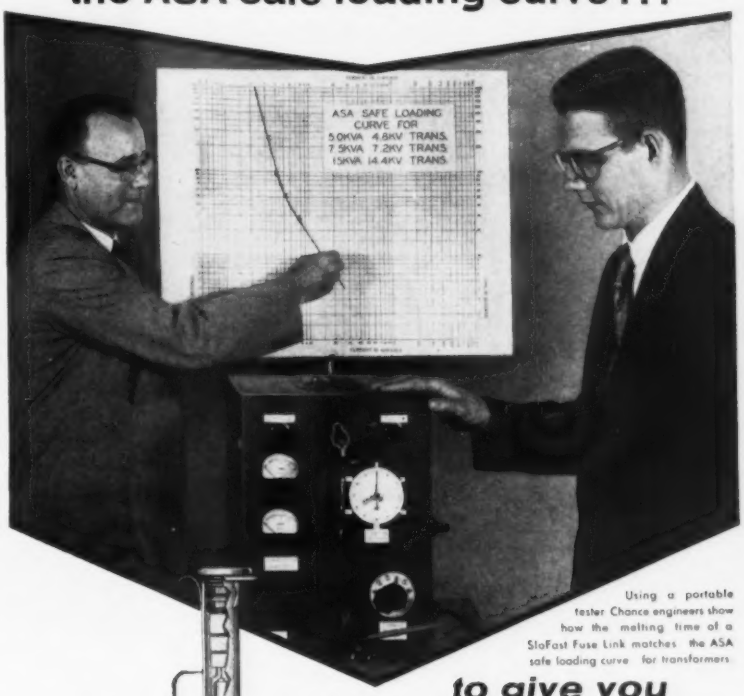
► Andrew L. Polich Inc., 734 N. W. Glisan St., Portland, has been appointed manufacturer's representative for Anderson Electric Corp. covering Oregon and southwestern Washington.

► Tubbs Electric, Spokane appliance distributor, has been appointed Hoffman home entertainment equipment distributor for 16 eastern Washington and 10 northern Idaho counties. Headed by **Clarence A. Tubbs,** the distributorship headquarters are at 165 S. Post St.

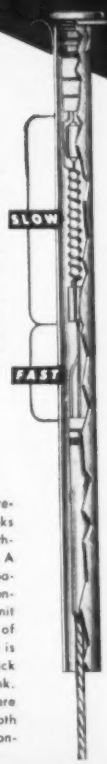
► Ward Terry & Co., Denver wholesale distributor for RCA products, announced two executive appointments. **Don Conrad** was named general manager of the RCA-Victor Instrument Division and **John Hammond** sales manager for the RCA-Victor Radio-Victrola department. Both men have been with the firm more than six years.

► Bruce Emmett Co., 830 S. E. Alder St., Portland, has announced addition of **Charles J. "Chuck" Maines** as lighting specialist. Maines will take over responsibility for the firm's lighting lines in Portland as well as sales supervision in outside territories. He has been with Stanley Sales Corp., San Francisco.

**CHANCE SloFast Fuse Links follow the ASA safe loading curve . . .**




Using a portable tester Chance engineers show how the melting time of a SloFast Fuse Link matches the ASA safe loading curve for transformers




Two current responsive elements. A slow element that operates on secondary faults and heavy overloads beyond the transformer capacity to protect the transformer; a fast element that operates to isolate the transformer and protect the system if internal failure or bushing flashover occurs.

Linemen can easily remove Chance fuse links from containers without removing gloves. A slight firm twist separates the single container from the 5 unit container. The end of each unit container is perforated for quick removal of the link. Type and rating are clearly marked on both ends of each unit container.

***to give you Full Overload Capacity Transformer Protection without unnecessary outages***

Chance SloFast (dual element) fuse links improve customer service continuity by providing for upward load swings that are within the safe limits of the transformer, while at the same time giving definite protection from damage or "burnout." A slow and a fast fuse element teamed up in a single link allow full use of transformer overload capacity, protect against secondary short circuits and overloads beyond safe values, and isolate the transformer from the system in the event of internal failure or bushing flashover. A plus advantage of Chance SloFast links is that repeated outages indicate the transformer is overloaded beyond safe limits and suggest the use of a larger transformer.

SloFast fuse links are available in both button-head and open link styles in a range of sizes from 0.2 to 10.4 amps . . . a link tailored for every rating of pole-mounted distribution transformer.

Write for Bulletin "Fuse Links and How to Use Them." It gives performance curves and application tables for all distribution voltages.

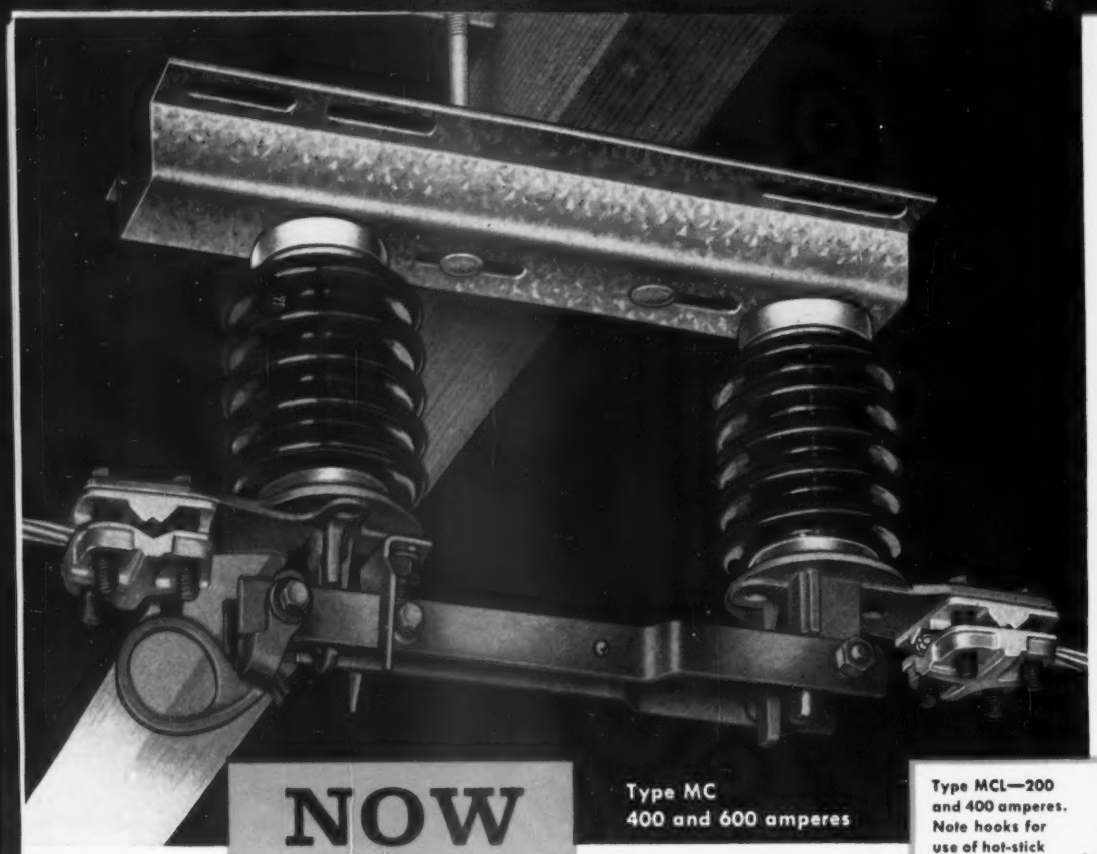
CF59-10

ABC

**A. B. CHANCE CO.**

CENTRALIA, MISSOURI

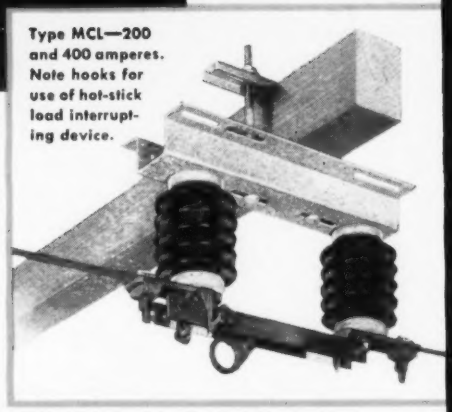
A. B. CHANCE CO., Ltd., of Canada



Write today for the Kearney Catalog, Section 6, on Hook Operated Disconnects

**NOW**

Type MC
400 and 600 amperes



Type MCL—200 and 400 amperes. Note hooks for use of hot-stick load interrupting device.

peak performance
at lowest cost with

# KEARNEY

## hook operated DISCONNECTS

Sturdy, simplified construction of Kearney Center Bolt type Disconnect Switches offers field-proved performance with substantial cost savings. Current-carrying parts comply with all NEMA standards for heat rise and surge capacity. One-piece casting of terminal pads and contacts minimizes transfer points, reduces heat. Blades and blade lock are exceptionally strong and rigid. See and test this superior equipment—discover how *you* can get maximum performance at minimum cost.

- **Blade withstands 80 lbs. thrust at 90° to pull ring without distorting.**
- **90° blade stop in open position checks blade from falling free.**
- **Positive latch and pry-out prevent galling.**
- **Hinges carry no current, permit best mechanical design.**

**JAMES R. KEARNEY CORPORATION • 4224-42 Clayton Avenue • St. Louis 10, Mo.**

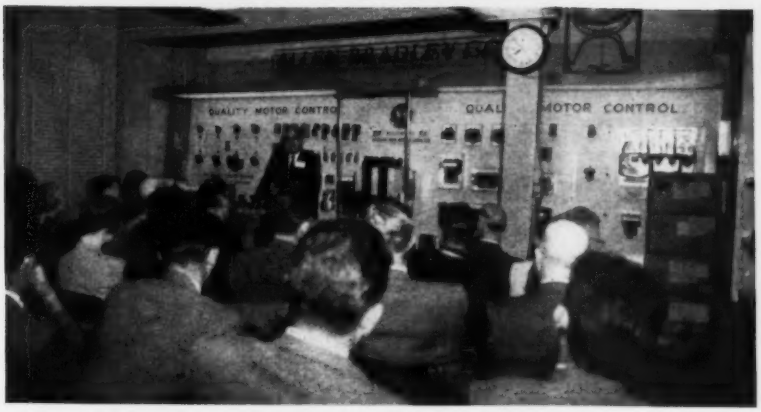
394

FOR BETTER CONSTRUCTION—SAFER MAINTENANCE

# Specify Kearney Products

*Plants at:* **ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA**

**IN THE WEST:** for prompt service, contact Kearney's West Coast Distributor, **Maydwell and Hartzell, Inc.,**
Los Angeles • Seattle • Portland • San Francisco • Spokane • Phoenix.




**With a background of equipment, Robert Griffin of Electric Corp. conducted shows**

## Distributor Stages Educational Shows

Contractors, plant engineers, journeymen and apprentice electricians in the Oakland and East Bay area were given an opportunity to attend a series of compact educational meetings on Allen-Bradley Co. electrical control equipment by the distributor for that area, the Electric Corp. of Oakland, in March and April. They attended in groups of 36, crowding the small display room of the distributor following a buffet meal catered to them.

It was strictly the distributor's show, aided only by the manufacturer's five-section display board shipped in for the purpose.

The meetings were scheduled according to the requests from the customers and prospects following a letter of invitation.

The entire staff got in on the program. Robert Griffin, manager, introduced his staff members who in turn spoke on some particular equipment. Barney Goodwin discussed the across-the-line starters; Lee Wachs, relays and contactors; Ivan Root, reduced voltage starters; Gus Donnelly, multicircuit motor control centers and a bank of relays, contactors and automation setups; Claude Hamilton, air break, high voltage contactor; Rex Pierre, pushbuttons, timers, limit switches, etc. Robert Applegate, office manager, acted as host in greeting the people and arranging the buffet.

Manufacturers' representative Campbell-George had two people present but they were only there to answer questions and not to put on the program.

Meetings started in March and averaged two a week and continued throughout April. Special meetings were arranged for electrical apprentices with the local union 595. Besides informing the customers Robert Griffin declared the schools, which might have disrupted their orderly setup for awhile, brought many benefits to his own staff. It made them better acquainted with the line by lecturing on it. They met their customers under relaxed circumstances. It made follow-up an easy matter.

► A first-quarter upsurge in business has caused **Clark Controller Co.** to increase shop personnel at its Los Angeles Division manufacturing plant. An upswing was noted across the board in all Clark's product lines, according to **King D. Christopher,** general manager, who said outlook for the rest of the year is "a far cry from what it was at this time last year."

► Hotpoint's new sales manager at Spokane is **W. L. Shearer,** formerly advertising manager for the northwest district at Seattle. His territory will include Butte, Mont.

► **James Bond** has been made general manager for the Lighting Dynamics Division of John C. Virden Co.

► **John Helms,** general manager at Incandescent Supply Co., San Francisco, has been appointed vice-president of the Phillips & Edwards Electric Corp.-Incandescent Supply Co. in charge of valley operations and will make his headquarters in the Sacramento house of Incandescent Supply. He will have supervision over the Fresno, Stockton, Sacramento and Redding offices of the combined company. At one time he managed the Incandescent Supply branch in Fresno.

## Officers Named by ESD

Official family of Electric Supplies Distributing Co. was announced by **Fred G. Goss,** president, after the annual meeting of its officers in San Diego. **Sam L. Hall** Sr. is board chairman. Goss is vice-chairman and president.

Other officers: **Gene M. Gramer,** vice-president of sales for all companies; **B. A. Murray,** vice-president, purchasing; **F. X. Delano,** vice-president, apparatus sales; **Ira Winchell,** assistant vice-president of radio and TV; **Jerry L. Goss,** secretary and assistant treasurer; **Charles M. Fox,** assistant secretary; **Sam Graham,** assistant secretary; and **Jack Cornelius,** assistant treasurer.

**H. W. Jeppesen** is both treasurer and vice-president assistant to the president. **M. C. Taylor** is vice-president in charge of the El Centro branch. **Sam L. Hall** Jr. is vice-president in charge of Long Beach branch.

The following manager appointments were confirmed: **Arthur Payne,** ESD Co. of Santa Ana; **Harold Bracy** of Anaheim; **James Haynes** of Arcadia; and **Robert Westfall** of Phoenix Electric Supply Co., Phoenix, Ariz.

► **Donald Shafer** has been promoted to assistant vice-president and manager of Distributors Inc., San Diego distributor of Westinghouse major appliances. He has been sales manager since last fall.

► **Dale G. Weber** of Dale G. Weber Co., Portland, attended the recent annual show of the Institute of Radio Engineers in New York. Extent of the show reflected the many-sided advances in the electronics field, according to Weber. It was opened officially with an amplified "beep" from the Vanguard satellite.

► **Norman Freeman** has joined Ramco Mfg. Engineering Co., Portland, as assistant to General Manager **Lester Ramberg.** As head of the engineering department, he will supervise production of baseboard electrical heating equipment and will also work with architects and engineers on residential and commercial heating installations. Freeman formerly was with Hayslip, Tuft, Hewlett & Jamison, Portland architects.

► **Jack Tindale,** former Anaconda district manager of Los Angeles and recently manager of utility sales in New York, has been promoted to vice-president of that company.

20 miles of SPANG Conduit are being installed in all buildings now under construction in this giant building program at a Pennsylvania university.

Architects: Howell Lewis Shay and Associates, Philadelphia, Pa.
Mechanical Contractor: Riggs Distler and Company, Inc., Philadelphia, Pa.
Electrical Contractor: Lecce Electrical Company, Williamsport, Pa.
SPANG Distributor: E. R. Beers Electric Company, Bloomsburg, Pa.

# "SPANG IS THE BEST CONDUIT AVAILABLE ON TODAY'S MARKET"

*says Mr. Frank Gallagher, Foreman for Lecce Electrical Company, Williamsport, Pa.*

"We don't have the problems with SPANG Conduit that we run into with most other conduits," states Mr. Gallagher. "Whenever my decision is called for in the purchase of conduit, I always call for SPANG; it's the finest I've used in 20 years.

"SPANG's uniform high quality means we don't have to chase bad threads or be bothered by 'hard spots,' which make bending difficult. Because less time is required to install wire runs with SPANG, there's a considerable savings in time costs.

"We're installing over 20 miles of SPANG Conduit to protect the wiring in the seven new buildings at a Pennsylvania university. We guarantee each job for one year, so we can't afford to use inferior materials. With SPANG, we know the job will be right the first time."

*Quality-controlled* SPANG Conduit is manufactured and inspected under rigid specifications to bring you the maximum in performance. Next job, call your local SPANG Distributor for the *top-quality* conduit that will give you *top-quality* service—SPANG.

**THE NATIONAL SUPPLY COMPANY**

SPANG CONDUIT

Subsidiary of Armco Steel Corporation

TWO GATEWAY CENTER, PITTSBURGH, PA.

*For phone number of closest representative see advertising index in back of book.*

# INDEX TO ADVERTISERS AND WESTERN SALES OFFICES

## May 1959


**Accurate Mfg. Co.** 118
San Francisco: The Curry Co. YUkon 2-0788
Los Angeles: F. J. Airey Co. MAdison 3-2706
Seattle: Electric Agencies MAin 3-2360
Denver: L. B. Putnam Co. TAbor 5-5066
Salt Lake City L. B. Putnam Co. ELgin 5-5558

**Advance Transformer Co.** 6
Los Angeles: Ray J. Noel Co. AXminster 2-0191
San Francisco: Ray J. Noel Co. HEmlock 1-2176
Portland: Fete Bach Electric CApitol 7-2173
Denver: A. J. Nelson KEystone 4-6751
Mercer Island, Wn. ADams 2-8795
Albuquerque CHapel 2-8626

**Allen-Bradley Co.** 17, 18
Los Angeles ANgelus 9-9421
San Francisco: Campbell & George MIssion 8-1236
Denver: Young Electric AComa 2-4841
Albuquerque: A & A Supply ALpine 6-0307
Salt Lake City: Stevens Sales INgersoll 7-5489
Phoenix: Edw. P. Weller AMherst 6-3188
Seattle: J. A. Tudor Associates MUtual 2-7444
Portland: J. A. Tudor Associates BElmont 2-1188

**Allis-Chalmers Mfg. Co.** 105, 107, 109
San Francisco DOuglas 2-8384
Los Angeles MAdison 6-2231
Phoenix CRestwood 4-5426
Denver CHerry 4-6556
Salt Lake City EMpire 3-1723
Portland CApitol 2-9835
Seattle MAin 4-3737

**Allis-Chalmers Hydraulic Div.** 111
San Francisco GArfield 1-5582

**Aluminum Co. of America** 4, 5
San Francisco YUkon 6-6484
Los Angeles HUntley 2-2684
Denver DUdley 8-1619
Spokane RIverside 7-6124
Seattle MAin 4-4040
Portland CApitol 2-9861
Boise 2-8038

**Blackburn Corp., Jasper** 30, 31
Los Angeles: Robert M. Schow HUbbard 3-7931
Oakland: John H. Ormond Co. TWinoaks 3-3235
Vancouver, Wash.: Bill Horning Sales OXford 4-4475
San Francisco: Kortick Mfg. (Ground Rods) VAlencia 6-6107

**BullDog Electric Products Co.** 27
Oakland: Safety Switchboard Co. LOckhaven 9-7001
Los Angeles: BullDog Elec. Products of L. A. ANgelus 9-8101
Portland: Coast Elec. & Mfg. Co. ATlantic 8-5373
Denver: Young Elec. & Mfg. Co. AComa 2-4841

**Burndy Corp.** 44, 45
Shaffer & Nelson, Inc. following cities:
Portland BElmont 4-7437
Seattle MUtual 2-0186
Spokane FAirfax 7-9528
San Francisco: George E. Honn Co. SUtter 1-7352
Los Angeles: Earl S. Condon Co. DUnkirk 1-3951
Denver: Peterson Co. DExter 3-5434

**Cereske, Wm. S.** 124
Oakland TEmplebar 2-3546

**Chance Co., A. B.** 125
San Francisco MIssion 7-1300
Seattle LAkeview 2-2009
Portland CApitol 8-3866
Denver FLorida 5-8521
Los Angeles NOrmandy 5-3521
Boise: J. O. Malvin Co. Boise 4-0148

**Classified** 122, 124

**Copperweld Steel Co.** 131
Los Altos, Calif. YOrkshire 7-4556
Bellevue, Wash. GLencourt 4-1233

**Duncan Electric Co. Inc.** 97, 98
Covina, Calif: C. C. Blecksmith EDgewood 2-2150
Reno: Kitchen Elec. Supply Co. FAirview 2-4533
Albuquerque: A & A Supply ALpine 6-0307
Phoenix: W. H. Eddy Elec. Prod. Inc. ALpine 2-6322
Billings: Montana Elec. Supply Phone: 2-0528
Denver: Hamilton Associates CHerry 4-1505
Shaffer & Nelson, Inc. in following cities:
Seattle MUtual 2-0186
Portland BElmont 4-7437
Spokane FAirfax 7-9528
Salt Lake City ELgin 5-8304

**Electro Compound Co.** 122
Los Angeles: Matzinger-Johnson Co. MAdison 4-8001
Portland: Oregon Mfg. Agents Capitol 6-3971
Denver: R&M Sales Spruce 7-2515

**Fanner Mfg. Co.** 56
San Francisco: Sold Through Line Material Industries PLaza 5-8600
Los Angeles RAymond 3-6251 and OXford 5-2260
Phoenix ALpine 4-8471
Denver: Slaybaugh & Thompson AComa 2-5826
Portland: A. L. Polich CApitol 3-6241

**Fargo Mfg. Co. Inc.** 123
Sold thru Line Material Industries:
San Francisco: PLaza 5-8600
Los Angeles: RAymond 3-6251 and OXford 5-2260
Denver FLorida 5-1689
Portland CApitol 2-1981
Seattle ATwater 3-6368
Spokane KEystone 5-2461
Salt Lake City ELgin 5-6257
Phoenix: J. E. Redmond Co. ALpine 4-8471

**Fisher-Pierce Co. Inc.** 32
San Francisco: Maydwell & Hartzell ATwater 8-6900
Los Angeles: Maydwell & Hartzell MAdison 8-7245
Phoenix: Maydwell & Hartzell ALpine 2-5858
Seattle: Oscar Hogenson MAin 2-0737
Portland: J. A. Tudor Asso. BElmont 2-1188
Denver: Allen I. Williams MAine 3-0343

**Fluor Corp. Ltd.** 24, 25
Los Angeles ANgelus 2-6111
San Francisco SUtter 1-5805

**G & W Electric Specialty Co.** 42
San Francisco:
C. E. Ingalls Sons GArfield 1-2916
Los Angeles:
R. E. Cunningham & Son MAdison 8-1105
Seattle: W. R. Hendrey Co. MAdison 3-3968
Salt Lake City:
Riter Engineering Co. EMpire 3-7933
Denver: H. C. Guire Co. SPruce 7-2864
Albuquerque: Frank W. Gorman CHapel 7-1596

**General Electric Co.**
**Schenectady, Apparatus Div. 35, 36, 37, 38, 39, 40, 49, 50, 51, 100, 101, 3rd Cover**
San Francisco DOuglas 2-3740
Los Angeles MAdison 5-7381
Phoenix ALpine 8-7724
Denver KEystone 4-7171
Boise 4-3021
Salt Lake City EMpire 4-1891
Portland ATwater 8-0281
Seattle MAin 4-8300

**Greenlee Tool Co.** 8
San Francisco: Lippincott Co. Inc. EXbrook 2-2687
Los Angeles: Lippincott Co. Inc. MAdison 8-8186
Seattle MAin 3-3085
Salt Lake City CRestwood 7-1298

**Hill Transformer Co.** 4th Cover
San Carlos LYtel 3-2161
Los Angeles: Maddox Sales Co. MAdison 4-2306
Seattle: Wm. O. Proby & Assoc. MAin 3-3483
Portland: Wm. O. Proby & Assoc. CApitol 8-7261
San Francisco: Campbell & George MIssion 8-1236
Denver: H. C. Guire SPruce 7-2864
Salt Lake City: Stevens Sales INgersoll 7-5489

**Holophane Co. Inc.** 99
Atherton, Calif. DAvenport 4-4366
Bremerton, Wash. TRiangle 6-4069
Montebello, Calif. RAymond 3-5738
Littleton, Colo. PYramid 4-4527

**Hotpoint Co., Div. G. E. Co.** 48
San Mateo-San Francisco DIamond 2-5591
Los Angeles MAdison 4-9201
Seattle MAin 3-8340
Portland CApitol 6-3776
Denver KEystone 4-0131

**Hubbard and Co.** 117
Emeryville, Calif. OLympic 2-6600
Los Angeles MAdison 4-8631
Oswego, Portland NEptune 6-2390
Salt Lake City ELgin 5-9478

**Hubbell, Inc., Harvey** 20
San Francisco MIssion 7-3240
Los Angeles MAdison 8-7226
Denver: Paul A. Douden KEystone 4-6798
Spokane: Elmer Johnson MAin 2518
Seattle: Frank A. Strohecker MAin 3-0357
Portland: David King CApitol 8-1990

**Indiana Steel & Wire Co. Inc.** 26
Graybar in following cities:
San Francisco MArket 1-5131
Los Angeles ANgelus 3-7282
Portland CApitol 7-6641
Seattle MUtual 2-0123
Denver TAbor 5-7111
Salt Lake City ELgin 9-8771

**Jet Line Gun Co.** 110

**Johns-Manville Corp.** 47
San Francisco DOuglas 2-4353
Los Angeles LUdlow 7-2141
Seattle MElrose 3-4300
Denver KEystone 4-6378
Salt Lake City EMpire 4-8446
Portland CApitol 3-8260

**Kearney Corp., James R.** 126
Maydwell & Hartzell, Inc., in following cities:
San Francisco ATwater 8-6900
Los Angeles MAdison 8-7245
Seattle MAin 4-2368
Portland CApitol 8-4173
Spokane MAdison 4-3285
Salt Lake City: Conely Engineering Co. EMpire 3-5013
Boulder, Colo.: Robert Smith HIllcrest 3-1795

**Kerite Co.** 46
San Francisco DOuglas 2-4118
Glendale, Calif. CHapman 5-3721

**Klein & Sons, Mathias** 28
Glendale, Calif. HOllywood 5-4351


(Continued on page 130)

# INDEX TO ADVERTISERS AND WESTERN SALES OFFICES

## May 1959

(Continued from page 129)


**Lapp Insulator Co. Inc.** ..... 112
San Francisco: Donald E. Ingalls ..... JUneau 6-0332
Los Angeles: Earl S. Condon & Co. ..... DUnkirk 1-3951
Seattle: Charles F. James ..... MAdison 3-1531
Salt Lake City: Riter Engineering Co. ..... EMpire 3-7933
Butte: R. E. McDonough Co. ..... 2-5447

**Lighting Dynamics** ..... 132
Los Angeles ..... RAymond 3-9101
San Francisco ..... JUniper 6-5266
Seattle: Norwest Co. ..... ATwater 4-7820
Portland: Northwest Sales Co. ..... CApitol 3-5959
Salt Lake City: John W. Reynolds ..... HUnter 4-1133

**McCabe Powers Auto Body Co.** ..... 3
Berkeley ..... LAndscape 4-4416
Portland ..... BEImont 6-1178
Pomona ..... NAtional 4-6464
Phoenix ..... BRidge 5-5774
Salt Lake City ..... DAvis 2-5658
Spokane ..... FAirfax 5-2591
Los Angeles ..... RIchmond 9-3424

**McGraw-Hill Book Co.** ..... 124

**Marcus Transformer Co. Inc.** ..... 122
San Francisco: E. B. Cook Co. ..... UNderhill 1-2621
Los Angeles: Pacific Industries ..... WEbster 3-0335
Seattle: N. R. Schultz Co. ..... SEneca 6-6369
Denver: R & M Sales Co. ..... SPruce 7-2515
Albuquerque: McGillan Sales Co. ..... ALbuquerque 5-5239

**Mark & Co., Clayton** ..... 10
San Francisco: Hodges & Glomb, Inc. ..... UNderhill 1-2367
Los Angeles: Rutkin Elec'l. Sales Co. ..... MAdison 3-1224
Denver: W. E. Young Co. ..... AComa 2-4841
Seattle: Electric Agencies ..... MAin 3-2360

**Mason Co., L. E.** ..... 53
San Francisco: G. M. Howard & Assoc. ..... MArket 1-6759
Los Angeles: John M. Fincke Co. ..... CApitol 5-4226
Portland: Pacific Electric Sales Co. ..... BEImont 5-4137
Denver: Harry F. Ream Sales Agency ..... CHerry 4-0558

**Moloney Electric Co.** ..... 29
Garland Affolter in following cities:
San Francisco ..... EXbrook 7-1800
Los Angeles ..... MAdison 4-1864
Portland ..... CApitol 3-7349
Seattle ..... MUtual 2-4950
Denver: Hamilton Associates ..... CHerry 4-1505
Salt Lake: Riter Engineering ..... EMpire 3-7933

**Morrison-Pelsue** ..... 118
Denver ..... RAce 2-2834
North Hollywood: A. F. Johnson ..... STate 7-8544
Salt Lake City: W. H. Pingree Co. ..... EMpire 3-6731

**National Supply Co., Tubular Prod. Div.** ..... 128
San Francisco ..... DOuglas 2-2975
Los Angeles: Murphy-Hain Co. ..... MAdison 2-2138
Seattle: J. H. Stumph ..... MUtual 2-5232
Denver: Allen B. Carpenter ..... KEystone 4-0283
Farmington, Utah: David Merrill ..... AXtel 5-4631

**Ohio Brass Co.** ..... 15
San Francisco ..... SUtter 1-5060
Los Angeles ..... MAdison 4-8555
Seattle ..... MAin 2-3842
Denver ..... SKyline 6-7722

**Okonite Co.** ..... 119
Los Angeles ..... MAdison 4-9677
San Francisco ..... VAlencia 4-7474
Portland ..... CApitol 8-3173
Seattle ..... MAin 4-5277
Denver: Sales Engineers ..... AComa 2-4893
Salt Lake City: Sales Engineers ..... HUnter 5-3457

**Orangeburg Mfg. Co. Inc.** ..... 57
San Francisco ..... YUkon 6-0462
Santa Ana ..... LIncoln 4-1195
Seattle ..... MUtual 2-4566
Newark, Calif. ..... SYcamore 3-2200

**Pacific Gas and Electric Co.** ..... 41
San Francisco ..... SUtter 1-4211

**Paranite Wire & Cable Div., Essex Wire Corp.** ..... 52
Los Angeles ..... RAymond 3-4794
South San Francisco ..... PLaza 6-3030
Portland ..... CApitol 3-6124
Seattle ..... MAin 3-5641

**Pennsylvania Transformer Div.** ..... 61, 62, 63, 64
San Francisco: George E. Honn Co. ..... SUtter 1-7352
Los Angeles: John G. Corrin ..... MAdison 2-0830
Seattle: Fred W. Carlson ..... ATwater 4-4633
Phoenix: Roy E. Coulson ..... WIndsor 3-8935
Denver: Peterson Co. ..... DExter 3-5434
Salt Lake City: Clarence W. Silver ..... ELgin 5-5378

**Preformed Line Products Co.** ..... 60
San Francisco: K. M. Ryals Co. ..... YUkon 2-5510
Los Angeles: Earl S. Condon Co. ..... DUnkirk 1-3951
Seattle: Shaffer & Nelson Inc. ..... MUtual 2-0186
Portland: Shaffer & Nelson Inc. ..... BEImont 4-7437
Salt Lake City: Shaffer & Nelson Inc. ..... ELgin 5-8304
Spokane: Shaffer & Nelson Inc. ..... FAirfax 7-9528
Denver: Peterson Co. ..... DExter 3-5434

**R T & E Corp.** ..... 2nd Cover
Portland ..... MErcury 9-2161
Medford: H. L. Mooney ..... SPring 2-9948
San Jose: N. R. Beebe ..... ANdrews 4-5641
Pasadena: D. B. Cole ..... SYlvan 0-5977
Salt Lake City: T. R. Van Wagoner Co. ..... INgersol 6-2461
Bellevue, Wn.: K. H. DuBois ..... SHerwood 6-4114
Butte: R. A. Manning ..... Butte 2-9200

**Republic Steel Corp.** ..... 33
San Francisco ..... GArfield 1-0977
Los Angeles ..... MAdison 4-5144
Portland: Shaffer & Nelson Inc. ..... BEImont 4-7437
Seattle: Shaffer & Nelson Inc. ..... MUtual 2-0186
Spokane: Shaffer & Nelson Inc. ..... FAirfax 7-9528
Denver: C. D. Belt Co. ..... SKyline 6-9421

**Rome Cable Corp.** ..... 94, 95
Los Angeles ..... RAymond 3-3631
San Francisco ..... VAlencia 6-3580
Seattle ..... MAdison 4-3017
Salt Lake City ..... ELgin 9-8811
Denver ..... KEystone 4-0533

**Royal Electric Co. Inc.** ..... 16
Los Angeles: Eckert-Lloyd Co. ..... RIchmond 7-9655
San Francisco: Eckert-Lloyd Co. ..... HEmlock 1-5792
Seattle: Northwestern Agencies ..... MAin 3-8882
Portland: Northwestern Agencies ..... CApitol 7-0434
Phoenix: Wm. Benndorf ..... CRestwood 7-1662
Denver: Hyde Electronics Co. ..... WEst 6-3456

**S & C Electric Co.** ..... 9
Burlingame, Calif. ..... OXford 7-1130
San Gabriel, Calif.: Randolph Eng. Corp. ..... CUmberland 3-4183
Phoenix: Randolph Eng. Corp. ..... ALpine 8-5281
Salt Lake City: Riter Engineering ..... EMpire 3-7933
Seattle: Muth-Richards Co. ..... EAst 3-2128
Portland: Andrew L. Polich, Inc. ..... CApitol 3-6241

**Smoot-Holman Co.** ..... 43
San Francisco ..... MArket 1-8474
Los Angeles ..... ORegon 8-8981
Salt Lake City: J. R. Christensen ..... EMpire 3-4419
Seattle: F. C. Scharr ..... ATwater 2-9230
Portland: Clay Barton ..... CApitol 8-3520

**Southern California Edison Co.** ..... 34
Los Angeles ..... MAdison 4-7111

**Southern States Equipment Corp.** ..... 54, 55, 113
Seattle: Jos. C. Platt ..... MAin 3-6141
Salt Lake City: H. Lee Rawlings Co. ..... INgersoll 6-3703
Denver: R. T. Lewis Co. ..... EAst 2-8887
Los Angeles: W. E. Kirk Co. ..... MAdison 4-3651
Portland: H. C. Anderson ..... CApitol 2-4551
Oakland: John H. Ormond ..... TWinoaks 3-3235

**Square D Co.** ..... 58, 59
Los Angeles ..... CApitol 1-1171
San Francisco ..... JUniper 7-4590
Seattle ..... EAst 3-1474
Portland ..... BEImont 4-8488
Denver ..... KEystone 4-6234
Salt Lake City ..... DAvis 2-5859
Phoenix ..... ALpine 8-6448
El Paso ..... KEystone 3-0544
Spokane ..... FAirfax 8-3690
San Diego ..... BEImont 3-7621
Fresno ..... AMherst 8-6268

**Subox, Inc.** ..... 11
San Francisco: Wrathal & Krusi ..... EXbrook 7-3593
Los Angeles: R. E. Cunningham & Son ..... MAdison 8-1105
Portland: Wm. J. Cottrell & Assoc. ..... CApitol 7-6191
Seattle: W. R. Hendry Co. ..... MAine 3-3968
Denver: Ambler Co. ..... TAbor 5-8885

**Superior Cable Corp.** ..... 106
Maydwell & Hartzell, Inc., in following cities:
San Francisco ..... ATwater 8-6900
Los Angeles ..... MAdison 8-7245
Phoenix ..... ALpine 2-5858
Portland ..... CApitol 8-4173
Seattle ..... MAin 4-2368
Spokane ..... MAdison 4-3285

**Triangle Conduit & Cable Co.** ..... 22
San Francisco ..... UNderhill 3-6260
Los Angeles ..... RAymond 3-3687
Seattle ..... MUtual 2-3971
Denver ..... SPruce 7-2375

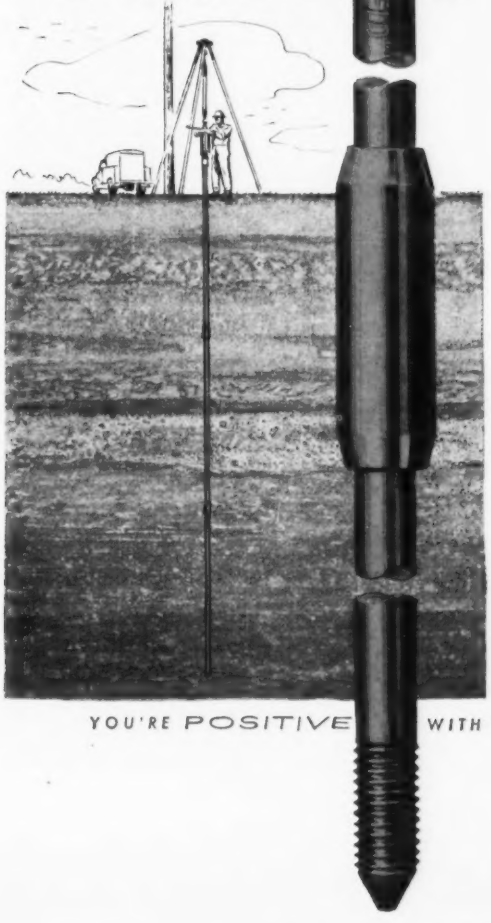
**Utility Body Co.** ..... 21
Oakland ..... TWinoaks 3-8980
Los Angeles: Jumbo Equip Co. ..... RIchmond 9-6272
Portland: Douglas Hood Co. ..... CApitol 2-9178
Seattle: Truck Welding & Equip. Co. ..... ATwater 4-1172
Spokane: Evergreen Truck Equip. Co. ..... KEystone 5-3677
Salt Lake City: The Lang Co. ..... DAvis 8-8341
Boise: The Lang Co. ..... Boise 3-4933
Phoenix: Trailmobile, Inc. ..... APplegate 8-8568
Albuquerque: Rio Grande Sales ..... CH 2-5403
El Paso: Hobbs Trailer Sales Co. ..... KEystone 2-2489
Denver: Jacobs-Kerr & Co. ..... TAbor 5-5328

**Virden Lighting, Div. of John C. Virden Co.** ..... 120
Atherton, Calif.: W. G. Sawyer ..... DAvenport 5-4931
Seattle: Donald S. Gleason ..... LAkeview 5-5151
Portland: Clyde E. Dodd ..... BUtler 5-3271

**Westinghouse Electric Corp.** ..... 12, 13
San Francisco ..... EXbrook 2-5353
Los Angeles ..... MAdison 6-3881
Denver ..... KEystone 4-8121
Phoenix ..... ALpine 8-8621
Salt Lake City ..... ELgin 5-3413
Seattle ..... MAin 2-0808
Portland ..... CApitol 2-9151
Spokane ..... FAirfax 8-3371

# DRIVE DEEP WITH Copperweld®

## sectional ground rods

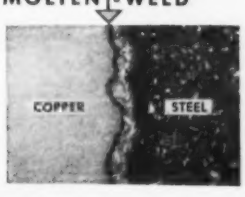


Don't jeopardize your overhead line performance by skimping on ground rods. You can achieve reliable, low-resistance ground connections by driving Copperweld Sectional Ground Rods deep into the earth's sub-surface where there are good conducting soils. And by measuring resistance after each sectional rod is driven—allowing for seasonal variation—you can make sure of permanent grounding protection.

Drive deep with Copperweld! You'll improve line performance, promote safety, avoid damage, and assure uninterrupted service.

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

YOU'RE POSITIVE WITH THE **MOLTEN-WELD**




This microphotograph of the weld area of Copperweld Ground Rods shows how the grains of copper and steel alloy to form a permanent, continuous weld. No other process achieves this inseparable union.

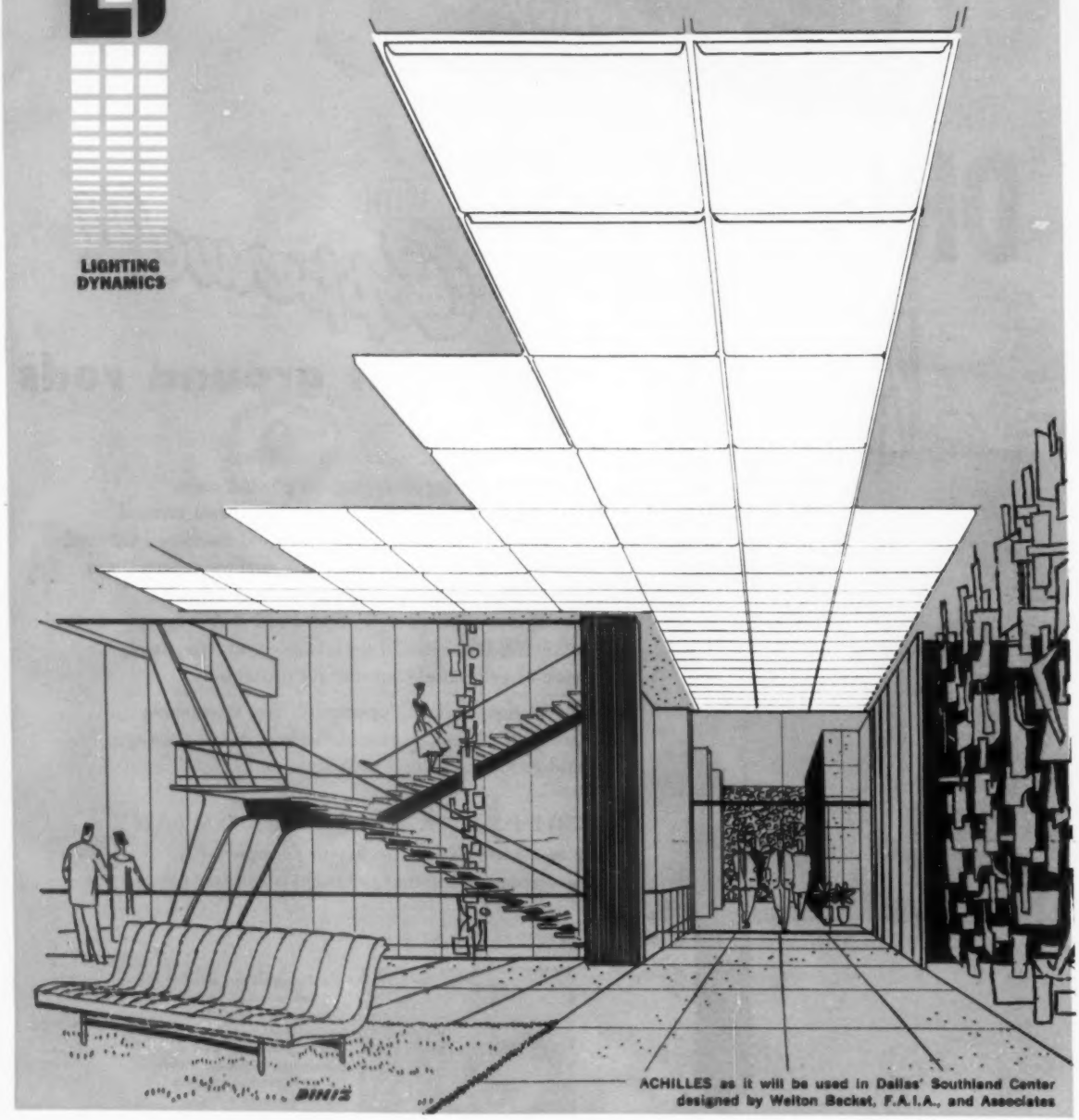
*For phone number of closest representative see advertising index in back of book.*

# problem solution

An easily maintained, integrated fixture was needed for Welton Becket's dramatic "squares of light" ceiling in the lobbies and offices of Southland Life's spectacular 42-story Southland Center in Dallas.

ACHILLES by Lighting Dynamics was specified for the lobby... and it's companion Apollo was used in the offices throughout the center. Achilles is a highly versatile fixture series ideal for this demountable acoustical ceiling—just as it is for countless other ceiling suspension systems. It's quickly installed with a drop-in installation and has easy maintenance with press-to-open catches and hook-on hinges. Durable, Bonderized and electro-static, high-reflectance finishes... FOR MORE COMPLETE INFORMATION, call your Lighting Dynamics representative, or write to Lighting Dynamics, 802 West Whittier Blvd., Whittier, California or Lighting Dynamics, 8700 Ambassador Row, Dallas, Texas.

LIGHTING DYNAMICS

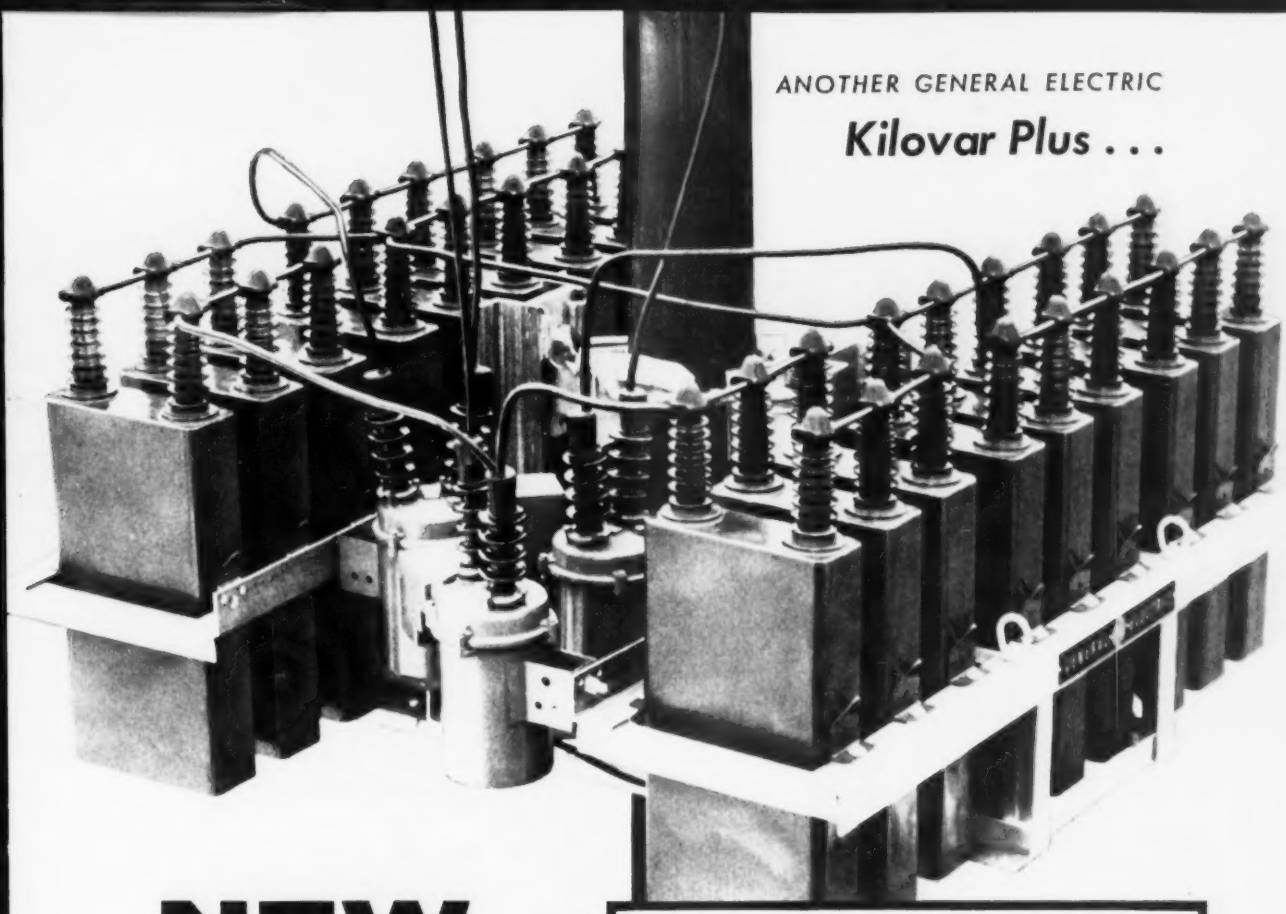


ACHILLES as it will be used in Dallas' Southland Center designed by Welton Becket, F.A.I.A., and Associates

*For phone number of closest representative see advertising index in back of book.*

ANOTHER GENERAL ELECTRIC

## *Kilovar Plus . . .*



# NEW

## Twin-cluster Equipment Puts More Capacitors on the Pole

- More capacitors per pole—up to 1200 Kvar for 15 Kv systems, and 900 Kvar for 24.9 Kv systems
- Lower cost per installed kilovar than for smaller rated pole-top equipments
- Perfect balance of twin capacitor racks practically eliminates bending moment on pole

**YOU GET MORE CAPACITORS PER POLE**—at a lower installed cost per kilovar—with General Electric's new twin-cluster equipment. New design allows up to 1200 Kvar to be installed using the same pole space required by a 600 Kvar in-line equipment. Higher ratings further decrease the cost of switched capacitors by reducing the switch and control requirements per kilovar.

**LIGHTWEIGHT STRUCTURAL ALUMINUM RACKS** and **STAINLESS STEEL CAPACITOR CASES** resist corrosion and require no protective paint maintenance, helping to cut maintenance costs.

**FACTORY-ASSEMBLED** racks and compression-type cluster brackets make possible fast, easy, and inexpensive installation.

**AMPLE CLIMBING SPACE** between racks—over 30 inches—provides linemen with easy access to equipment for installation, connection and inspection.

**SEE FOR YOURSELF** how General Electric's new twin-cluster capacitor equipments can help put more kilovars on your system at less cost. Contact your nearest G-E Apparatus Sales Office, or write to Section 445-23, General Electric Co., Schenectady, N. Y.

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

# HE'S BUILDING EXTRA, SERVICE-FREE YEARS INTO YOUR NEXT TRANSFORMER

## Coil winding... another fully-integrated phase of HILL manufacturing

Sound manufacturing practices... skilled employees using the most modern techniques and equipment... are only part of the reason why HILL produces transformers with *built-in* extra years of trouble-free service.

Equally important are HILL's complete, *fully-integrated* production facilities. One-management control of every step... from original design to final shipment... is an essential ingredient of quality control. Uniformly high test results on HILL transformers prove it!

*Your thorough investigation of this all-Western source of power and distribution transformers is invited. Start today by writing for Catalog #2000.*

**HILL TRANSFORMER CO., INC.**
1030 WASHINGTON STREET SAN CARLOS, CALIFORNIA

HILL

***"TRANSFORMERS THAT STAY IN SERVICE"***

Sales representatives in Seattle, Portland, San Francisco, Los Angeles, Salt Lake City, Denver, Albuquerque, Dallas, Houston, Oklahoma City, Minneapolis and Honolulu.